Vol. XXIV, No. 2
MARCH, 1957

# THE SCIENCE TEACHER




- STAR Award: Living Biology
- Science Teaching in 2057
- A College Look at High School Science
- Science Project Ideas
- 1957 Convention Highlights

JOURNAL OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION

# THE SCIENCE TEACHER

**Vol. XXIV, No. 2** **March, 1957**



Articles published in THE SCIENCE TEACHER are the expressions of the writers. They are not a statement of policy of the Association or the Magazine Advisory Board.

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## THE SCIENCE TEACHER

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## *Coming . . .*

### in *The Science Teacher*

- STAR Award Reports
- Teachers in Industry
- On the Target
- Making an Effective Microscope Lamp

## Editor's Column

This month, no other subject for discussion would be as timely or appropriate as that of the annual convention of a professional society. Why have an NSTA convention? What do those who attend expect to derive from it? What about those who do not attend? Can they derive anything from it?

We should ponder these and similar questions as we look forward to NSTA's 5th National Convention March 20-23 in Cleveland, Ohio. Some 1500 teachers will be there at an average expenditure of perhaps $100. Will we get value received for this investment which will amount to a total of $150,000?

Conventions and all other NSTA activities should contribute to Association goals. Our conventions aim most directly at the goal of "a professionally qualified and competent science teacher in every science classroom." This year's convention, according to the planning committee, has been designed to provide stimulation and inspiration. The talents and experience of the participants promise a bull's-eye hit on the target. The opportunity to hear person-to-person reports from national figures, from leaders among our own ranks; the many chances to talk with these people informally, to present and discuss differing points of view, to relate and to hear about diverse experiences—these are among the choice offerings of a national convention. And all the while you are "getting" out of these exchanges, you are also "giving"—for whether you realize it or not, the fact that you are there makes you "a leader from among our own ranks."

There are, of course, many other tidbits to be picked up as the convention hours roll by: The friends you meet, the good feeling at seeing and talking with them again after a lapse of a year or more . . . the practical, down-to-earth ideas you carry home from the "Here's How I Do It" sessions . . . the satisfaction you get out of having your principal, superintendent, and school board support (with financial help, we hope) your attendance at the convention and of being asked to "report back" to the rest of the science faculty when you come home . . . the contacts you make which may (who knows?) lead to improved job situations and satisfactions . . . the stimulating displays of student projects and of textbooks, laboratory equipment, and other science teaching aids available through commercial channels . . . the glamour of visiting, perhaps for the first time, another of America's major cities . . . the tours and field trips to schools and science-based industries in the area . . . the "after hours" and "in between times" fun and relaxation (pardon me; social activities) that go with convention life. Even this list does not tell the complete story of convention "attractions."

Yes, we think there'll be value received for the $150,000 we'll spend for the Cleveland convention; even for the "stay at homes" to whom we'll try to bring much of the convention by way of *TST*. We hope this is just "time out" for them and that they'll be joining the party in Denver in 1958 or Atlantic City in 1959.

Robert H. Carleton

# STARlight

The first of the STAR reports which will be printed in *The Science Teacher* begins on page 62 of this issue. It's titled "Living Biology" and is the work of Ruby E. Wheeler, biology teacher at Stratford High School, Stratford, Connecticut—near Bridgeport.

Your editors think you'd like to know some of the mechanical and related problems that are involved in getting a magazine "to bed." That, of course, means getting the journal on the press and printed on schedule. The editors and the printer set the schedule—and it has to be met, if the magazine is to be published on time.

The story of Miss Wheeler's article and its publication in *TST* is a specially interesting example of how a magazine goes to bed on time.

According to the schedule, all editorial copy had to go to the printer on Monday, February 4. On Friday, February 1, shortly after the STAR award winners had been selected by the judges, an editorial conference was held. It was then decided to print the report of one of the ten cash award winners in the March issue of *TST* (the others will be announced at the NSTA Convention in Cleveland this month: March 20-23). Miss Wheeler's report was selected for a number of reasons, one of them being that *TST* has not recently printed enough articles on biology (according to some of our readers).

But then, as the editors discussed it, we needed a photograph of Miss Wheeler and some biographical background. The copy deadline was approaching—too close to allow for letter-writing. Telephone Miss Wheeler? The only address we had was Stratford High School. By the time the Friday editorial conference ended, it was far past school-closing time. Let it go until Monday, that February 4 deadline? Could be—but this was now the make-up editor's problem, and the make-up editor had planned to draft the special layout for the STAR article over the weekend.

There was only one answer: telephone Miss Wheeler during the weekend.

From here on, we'll just refer to the make-up editor as "we."

We called the Washington long distance operator, asked for the phone of Ruby E. Wheeler in Stratford, Connecticut. When the operator contacted Stratford, there was no phone for Miss Ruby E. Wheeler. We said Stratford might be a small city, where even the telephone operators there might know the names of the high school teachers. Over the long distance phone, we were told quite frankly otherwise.

Stratford, in the Connecticut operator's words, is *no* small town. . . .

We were almost ready to give up—but decided to ask "long distance" for the name of the Stratford High School's principal. That didn't work out, either. It seems you can find the names of doctors and clergymen, without knowing who they are, by long distance—but not educators.

At this point, we did decide to give up—let it go until Monday, even if it meant a last-minute rush to make the copy deadline. But, by now, the Washington telephone

operator was interested. She suggested calling the Stratford police. We didn't want to arouse the town's curiosity. She—the telephone operator—assured us she'd tell the police it was not an emergency. We listened to her as she put the call through. She did beautifully. A police sergeant answered. He seemed to know the name of Ruby Wheeler. There was no hesitation in his reply. He said to wait a moment. In less than a moment, he was back on the phone. He said to call such-and-such a Wheeler at such-and-such an address. He added he believed he was giving us the correct number; if not, to please phone back—he'd try again.

By this time, we were telling the telephone operator how much we appreciated her service—how right she had been in gently insisting she could help. We got Miss Wheeler.

When we explained to Miss Wheeler how we got her (she admitted she'd been puzzled), she replied, with a laugh in her voice, that it wasn't surprising—that she'd taught most of the local policemen.

In what's above, we give *cudos* to both the police of Stratford (though the police phone number was Bridgeport) and especially to our Washington long distance operator. But what did we find out about Miss Wheeler?

When you read her article in this issue of *TST*, remember this: She's a graduate of Stratford High School, she began teaching immediately after she was graduated, beginning in the primary grades, then intermediate, then high school, because of, as she told us, "the shortage of teachers." She taught in country schools in "both sides of the state (Connecticut)" and when she had a general science class—as she says, "overflow class"—to teach, she "taught out of the book, kept two pages ahead of the kids." She was asked to take over a biology course because of lack of teachers. On this, she reported, "I taught biology and learned it as I went along." But teaching biology prompted her to more study. She now has both a BS and an MA from New York University.

Miss Wheeler wants to keep on teaching biology. She lives with her family, her main hobby is photography, and the photographs accompanying her article are hers.

In the pleasure and delight of finding such an interesting telephone interview, we too-quickly said, "If photography is your hobby, why do you need one of your students to take a picture of you for the magazine?"

Miss Wheeler, who claims she can now retire, but won't, laughed gaily and said, "How can I take a picture of myself?"

# Readers' Column

I've just reread the Editor's Column in the December issue of *TST*. It reads beautifully, pulls no punches, and hits the nail on the head. However, I disagree with a very important item. I definitely do not believe that education courses will help improve the quality of teaching. Those who recognize their value do not need such courses, and those who need them are impervious to what they have to offer.

I would like to suggest one solution that works; at least it has for me. I maintain that a course at *any* level should be taught according to the best techniques that research has discovered. How ironic it is to sit in a graduate class and be *lectured* about the values of *learning by doing!* Accordingly, for a course I teach at New York University, I gathered all the most advanced ideas of teaching science, and in this course, "Science for Elementary School Teachers," I teach these adults, some older than I, exactly as they will teach their pupils. The students are hesitant at first. They come in expecting a "Here's How I Do It" session, with 40 demonstrations and mimeographed sheets to put away and forget about. When my students finish this course, however, they can go back to their elementary school and do a fine job of teaching science in areas they did not dare attempt previously. And—they learned it all by themselves!

I firmly believe that if you wish to improve science teaching, the way to do it is by using *desirable methods in teaching content* to the science teachers. Paul Westmeyer could not have gotten his inspiration to teach chemistry as he explains in his superb article, "Teaching Chemistry the Easy Way" (December *TST*), simply by sitting and listening, no matter how learned the lecturer may have been.

I sum it up this way: "Teach teachers as you would have teachers teach." Maybe we should make this the golden rule for science teacher education.

PHYLLIS B. BUSCH
*Brooklyn, New York*

The Editor's Column in the December 1956 issue of *The Science Teacher* makes more sense than any article which this writer has read concerning the teaching of science.

Many science teachers are well prepared as scientists, but not as teachers. The school needs teachers who know science and who can teach it. Perhaps the majority of cases where a loss of interest in science is manifest on the part of students can be traced back to a teacher who did not know or who did not employ the best teaching techniques.

Why not prepare science teachers by offering a special course in colleges and universities directed toward science teaching methods taught by teachers who have had considerable teaching experience at the junior and senior high school level?

L. W. Byous
*Principal, Eunice Junior High School*
*Eunice, New Mexico*

I'll appreciate help from *TST* readers in locating a copy of an out-of-print book. It's *Lecture Demonstrations in General Chemistry* by Paul Arthur, copyright, 1939, a McGraw-Hill book. I've tried every book store I could contact and other sources without success. Thanks for any tips.

Rosa Craig
*Box 602*
*Sutton, West Virginia*

I was a member of NSTA during the past year and I would like to renew my student membership for the 1957 calendar year. I am a senior this year at Iowa State Teachers and with an actual teaching position just around the corner, I have come to appreciate the advantages that membership in the Association offers to future teachers.

I enjoy especially the articles in *The Science Teacher* because in the past year's issues, I have found many which have helped in my studies here at college as well as provided helpful teaching suggestions.

Though this may sound suspiciously like an unsolicited testimonial, I thought you might want to hear what membership in NSTA means to a college student.

Jerry Janssen
*Iowa State Teachers College*
*Cedar Falls, Iowa*

The article by Dr. Carleton Lynde in the November *TST* on "High School Physics in Popular Dress" so intrigued me that I am impelled to add my testimony backed by 35 years as a high school physics teacher. It is not the first time Dr. Lynde has intrigued me. Many years ago I used his books and found them very interesting and useful. In his books I also discovered one who used *science* in teaching science. Too often science teachers, and other teachers, too, forget that our students are people and need to be understood.

I have always felt that science is something quite real and a part of all of us—a something that none of us can escape. This bit of philosophy I tried to sell to my students at the very start.

Much as Dr. Lynde described, I, too, used home experiments and practical class demonstrations with the class discussion. To motivate individual activity in the most democratic manner, I used several devices. For the potential engineer, I encouraged the building of working models to illustrate the use of the laws of physics. I felt that a student who built a model of a hydraulic brake gained far more in every way than if he had been assigned to work out ten to 15 rigged problems which he probably would not do.

Since one cannot open one's eyes in any direction without seeing the evidence of physics, I suggested to those less mechanically minded that I would allow credit for a scrapbook of pictures that showed the practical use of the laws and principles of physics discussed in class. For the strictly academic student, the traditional reading and mathematics prevailed. To obtain the cooperation of my students, I tried to sell them another bit of trite philosophy—that "if you learn something, it is your own fault."

In spite of all I did to motivate, I found it necessary to fail a very few students who also failed in other subjects. In checking the records from the university, I found that none of my students who went to the university were unable to carry on their work in physics. I know that the students and I were happy in our effort; had we been less happy, I doubt that we would have learned more. That is why I think when physics is properly motivated it *can* be the most popular subject in the high school and still be effective information-wise.

Edward J. Skibness
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## . . . the authors

Most of the books written by Laboratories authors are published by D. Van Nostrand Company. Other publishers include John Wiley & Sons and McGraw-Hill. Subjects include speech and hearing, mathematics, transmission and switching circuits, networks and wave filters, quality control transducers, servomechanisms, quartz crystals, capacitors, visible speech, earth conduction, radar, electron beams, microwaves, waveguides, antennas, traveling-wave tubes, semiconductors, ferromagnetism.

**Harold S. Black,** B.S. in E.E., Worcester Polytechnic Inst., author of "Modulation Theory."

**John R. Pierce,** Ph.D., California Inst. of Tech., author of "Traveling-Wave Tubes."

**Richard M. Bozorth,** Ph.D., California Inst. of Tech., author of "Ferromagnetism."

**W. Thornton Read,** M.S., Brown University, author of "Dislocations in Crystals."

**Hendrik W. Bode,** Ph.D., Columbia University, author of "Network Analysis and Feedback Amplifier Design."

**Walter A. Shewhart,** Ph.D., University of California, author of "Economic Control of Quality of Manufactured Product."

MILLER-ERTLER STUDIOS

**THIS MONTH'S COVER . . . is a window-eye view of the Public Square in Cleveland, Ohio—a view that many an NSTA-er will see from the Hotel Cleveland later this month. The occasion, of course, will be the 5th National Convention of NSTA, headquartered at the Hotel Cleveland, during the four full days of the meetings, Wednesday, March 20 through Saturday, March 23.**

**For a guide to what can be seen in this photograph: foreground, the Soldiers and Sailors Monument, a memorial to Cleveland's Civil War veterans; right, Euclid Avenue; left, Superior Avenue.**

**For a guide to what will go on for NSTA-ers in Cleveland, March 20-23: see the report on convention highlights and photographs of many of the participants, beginning on page 80 of this issue.**

**RCA Science Teacher Scholarships:** Thirty scholarships to encourage students entering the science teaching profession have been announced by the Radio Corporation of America. This scholarship program has been developed in response to the need for more qualified teachers of science and mathematics.

An extension of the long-established RCA Scholarship and Fellowship Program, the new program is described in part as follows by Brigadier General David Sarnoff, chairman of RCA's Board:

"The nation's leading educators have properly reminded us of our duty as citizens to make certain that we have adequate educational facilities, to provide appropriate compensation for our teachers, and promote those programs which are designed to increase the prestige and stature of our teachers. We sometimes forget the importance of the teacher who plays a key role in shaping the future destiny of our country and our world."

Ten RCA scholarships, providing an annual grant of $800, are going to be available each year to students during their sophomore, junior, and senior years at the following colleges and universities: Berea College, Berea, Kentucky; Adelphi College, Garden City, New York; Clark College, Atlanta, Georgia; University of Delaware, Newark; Goucher College, Baltimore, Maryland; West Virginia Wesleyan College, Buckhannon; University of Wyoming, Laramie; Trinity College, Hartford, Connecticut; St. Louis University, St. Louis, Missouri; and the University of Rhode Island, Kingston. Twenty other scholarships will be available at ten other institutions.

# Science Teaching in 2057

By ARCHIE J. NICOLETTE

Arbor Vitae-Woodruff High School, Woodruff, Wisconsin

**This article was submitted in answer to an Editor's Column invitation in the November 1956 *Science Teacher* for reports "looking backward from the year 2057 . . . on science teaching in those 100 years." Such articles were asked for as companion pieces to Sidney Rosen's "A Century of High School Science," which appeared in the November issue, and Gerald Craig's "Elementary School Science in the Past Century," which was printed in the January 1957 issue. The editors welcome Mr. Nicolette's piece and are particularly pleased by his literary offering since he is a new NSTA member who "discovered" *The Science Teacher* only four months before writing this article.**

**There are some "flights of fancy" in this piece—some are the editors'—and if you spot them, the editors ask your indulgence.**

IT was September 15, 2057, when a number of visitors were greeted in the principal's office of our school. They had come to study our school facilities and our outstanding educational program. These were strange to the visitors because of their unfamiliarity with modern education. As we knew, our guests had not been able to study American educational developments for quite a period. Some 75 years ago, taking off to explore other planets, they had somehow arrived on the then unknown planet Phoenix, where they experienced unusual life-preserving conditions. Just a few months ago, they had finally found their way back to earth and now were busy studying developments during their absence. We were pleased that our school had been selected as a model for them.

The visitors expressed appreciation of the science building, a modern structure of metal and plastic, set aside from the other buildings comprising our school. The hallways are not lined with the old-style lockers, but with display areas, terraria, natural flower gardens, and aquaria. The classrooms are all along the outside of the large circular building with facilities for common use in the center of the building. The group started on its tour of inspection.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

**Thumbs Up . . . On the tip of the thumb above is the cryotron, a new device which will replace complex tubes and expensive transistors in some electronic computers. This little wire with a tinier wire coiled tightly around it is shown on the thumb of Dudley A. Buck, graduate student and instructor in the Department of Electrical Engineering at the Massachusetts Institute of Technology, developer of the device. It is pictured here because the news it had been developed was announced as this article, stating the transistor was long outmoded, was going to press.**

Several students were setting up a display on "How Food is Manufactured" by present day methods for human consumption. A fine network of tubes carries carbon dioxide and water containing minerals and vitamins through a thin but wide slot, at which time a catalyst combines the raw materials when it is subjected to ultraviolet light lamps. Food can be produced with some minor changes. *(Please turn to page 97.)*


# LIVING

## AWARD

**This article is one of the ten cash award winners ($200) in the 1956 STAR (Science Teachers Achievement Recognition) Program, conducted by the National Science Teachers Association under a grant from the U. S. National Cancer Institute. The names of the other cash award winners as well as the names of those whose entries won medallions and honorable mention will be announced at the 5th National Convention of NSTA, which will meet in Cleveland, Ohio from March 20 through 23. This report was submitted in the category of teaching ideas that stress "motivation." The editors of The Science Teacher plan to print several more STAR reports. In addition, a brochure with abstracts from the winning entries will be published next fall; it will be sent free to all NSTA members and to others requesting it.**

Visitors, even the book salesmen, say that my biology room is unique. If so, wherein lies its uniqueness? I should say it stems from biology defined as the study of *living things*.

The average biology room is often enlivened (?) by only a small aquarium inhabited by goldfish, a snail, and a few water plants, and possibly a couple of geraniums struggling for survival on the window sill. My biology room bears little resemblance to a formal classroom except that it has the usual arrangement of laboratory tables and chairs. In addition to the ordinary furniture, however, it has hundreds of specimens of living things.

At present, there are rats—red, white, black, and hooded; rabbits—a gray and white Dutch and a large white one; guinea pigs of three varieties—English cavies, Abyssinian rough-coated, and Peruvian long-haired; and two cages of parakeets. These are all on the tables at which the students sit for classwork. In addition, we have Sammy, the gray squirrel, raised from babyhood and now six years old. There is a six-foot indigo snake, privately owned by a student, a water snake which gave birth to 17 young, and a very friendly hog-nosed snake. There are always miscellaneous skinks, salamanders, garter snakes, and whatever else arrives. On Ground-Hog Day, our tame woodchuck, Skippy, comes in for the day if he can be persuaded to wake up from his winter's nap in the cellar. This is our animal population today. Next year it may be quite different; it is never static.

Unfortunately, our school has no greenhouse or conservatory, but a view across the front of the room might create the impression of one. A tally shows about 70 house plants plus various plant projects—all in a room with a northwestern exposure and shaded by another wing of the building.

Is the room and the method good or bad? I shall not try to answer. It is my way of teaching. And I like it. So do most of my students, and that answer is good enough for me.

Several elements in my personal background have led to my philosophy of "living" biology. First of all, my life has been lived largely on a small farm where I have helped with many phases

of farm work. I still raise a good-sized garden and fill a large freezer with the results. Through this work, I have acquired firsthand knowledge of insect pests and their control, soil needs, and the willing help given by the state department of agriculture.

Secondly, my teaching experience has been varied. It began in a one-room, eight-grade country school, and has continued through all the grades. It was in the little country school that we borrowed a "broody" hen and acquired a setting of eggs. We "set" her in the woodshed, and at the end of the year divided up a dozen healthy, partly grown chicks among the families represented in the school. One youngster learned to his sorrow that it is not wise to test for the fertility of an egg by shaking it near the ear. It literally exploded! At the same school, I completely overcame my own great dread of snakes. It was a

living things is best learned by living with them.

There are some arguments against having a classroom full of living things. Many teachers say to me, "How can you hold the attention of students with animals on their tables?" My reply is that if the students are that bored with the lesson, at least they have something biological to keep them out of mischief. Actually, it is rarely necessary to caution a pupil to refrain from paying undue attention to the animals during a lecture or discussion period.

A second, more valid, argument against animals at the tables is that it creates a very messy room—not really smelly, but always a certain amount of sawdust on the tables and floor.

Then there are the complaints of students from other biology classes in the building. They say, "Why can't we have the animals in our biology

# BIOLOGY

**By RUBY E. WHEELER**

**Biology Teacher, Stratford, Connecticut, High School**

choice of accepting them nonchalantly into my hands or losing the respect of my barefoot country naturalists. Fortunately, I made the former choice.

I soon learned that it is not enough to tell a first-grader that, "One plus one equals two." Instead, you patiently show him apples, books, and other objects until his own experiences have taught him the correct concept. In my biology classroom, I am merely using the same graphic method of teaching and learning.

A third phase of my natural science background was in Girl Scout work. In addition to being leader of a troop, I specialized in Nature Merit badges. Four summers as a camp nature counselor added to my conviction that knowledge of

room, too?" I try to point out as tactfully as possible that this is not feasible in some classrooms due to double sessions, or to the use of the same room for subjects other than biology. I am fortunate in that I do not have to share my room. I also explain that it is not always the philosophy of the teacher, and that the use of such an abundance of living material is not really necessary to the successful teaching and learning of biology. I welcome these students to visit the room before school, and, with the permission of their own biology teacher, to participate in the care of the animals in my room.

The best argument in favor of an abundance of live things in the classroom is to provide a variety

of real experiences for all students. For the "gifted" student, an atmosphere of individual experimentation is provided. He is surrounded with the possibilities of carrying on original research to answer his own questions, or those that may arise in connection with the work of the classroom.

An example of the latter was a problem met in a rather routine dissection of rats in order to study the thyroid. Each rat that was opened had whitish spots on the liver but nowhere else; none had shown any signs of ill health. The lumps were opened and were found to be encysted tapeworms. The problem which developed was to find the possible source of infection for laboratory-raised rats.

Another question that we have encountered is, why are all the planaria that I collect in a certain spring on our property infested with internal parasites? Many times I have been called excitedly to look through a student's microscope at the planaria "having babies!" The student had broken through the outer layer of the planaria, and was releasing the parasites.

The student of average or below average ability also has opportunity to participate. Actually, many of these students are just as interested in solving problems that arise as are those of superior ability.

Recently, Bill, interested in biology, but of average scholastic ability, asked, "How long can a mouse and a plant live in an airtight container?"

I replied, "How long do *you* think? Would you like to try it?"

When the plant produced too little oxygen and the small mouse was found nearly dead, I was not too disturbed. Instead, someone was sent scurrying to the chemistry room for the makings of some oxygen and, in a very few minutes, pure oxygen was pouring into the bell jar. The mouse began to stir, and shortly commenced to wash his face. A miracle of modern medicine had been witnessed, a new lesson learned. Does every individual in each of my five classes benefit? Not always, for the greatest value is to Bill and to the small group that wandered in just in time to watch the race against death for one small gray mouse.

**Preparation of protein deficiency diet for rats**

Some students do enjoy working on "cookbook" experiments. Such a one recently completed by two girls in a noncollege preparatory group certainly emphasized the folly of drastic reducing diets in which the intake of carbohydrates is cut to nearly zero. The young rat with no carbohydrate —a "teen-ager rat" I call him—was dead within a week. The control rat, which was fed exactly the same food plus cornstarch, was healthy and gaining a normal amount of weight. Two girls from another group repeated the experiment shortly after, and the results were the same. This experiment also points out the need for insulin by many diabetics in order that they may utilize the much-needed carbohydrates.

Can rats tell colors? Experimental rats are conditioned to expect powdered food (complete diet) dyed a bright green, and drinking water which is bright purple. After a month they are given a choice of white food and green food, plain water and purple water—and the students thrill at the rats' choices. The value of such a project is not in the answer. It is in the planning, the carrying out of the daily chores necessary in caring for the animal, the overcoming of difficulties, and the triumph of success.

The gifted student may choose a more intricate problem such as the one carried out by George last year which won him a top prize in the Southern Connecticut Science Fair and the honor of entering the New England Science Fair at Boston. His project concerned the absorption of radioactive iodine in the thyroid of the rat. It included such factors as tracing the path of the iodine through the body, the rate of absorption, the rate of elimination, and the effect of the iodine on the rat.

Many obstacles had to be overcome as the project progressed. George soon discovered that the rats could not be given the iodine in their drinking bottles because they had the habit of drinking one drop and then washing themselves with the next drop. A second big problem was to devise a method whereby a rat could be held firmly and

safely on its back in order that a Geiger-counter reading could be taken. A trip to the veterinary, and a small-size wooden model of his operating table, solved this difficulty but not until the addition of a slot in the center through which a wide band of gauze could be tied around the belly of the rat.

Another use of living material in the classroom is in the presentation of various types of subject matter to the group as a whole. For example, we are studying plants. I bring in a complete cornstalk, roots and all. One day it illustrates a typical monocot plant with parallel-veined leaves, the stalk supported by a stout rind, its fibrovascular bundles scattered throughout the stem, and its kernels of ripened corn exhibiting one cotyledon each. We study roots, and here are fibrous roots and the interesting prop roots holding up the tall stalk like guy wires on a telephone pole. Another day it becomes part of the nitrogen cycle. If it is infested with smut, it illustrates the relationship of parasite and host. Finally, it is a perfect example of a plant with staminate flowers in the tassel, and pistillate ones in the "silk."

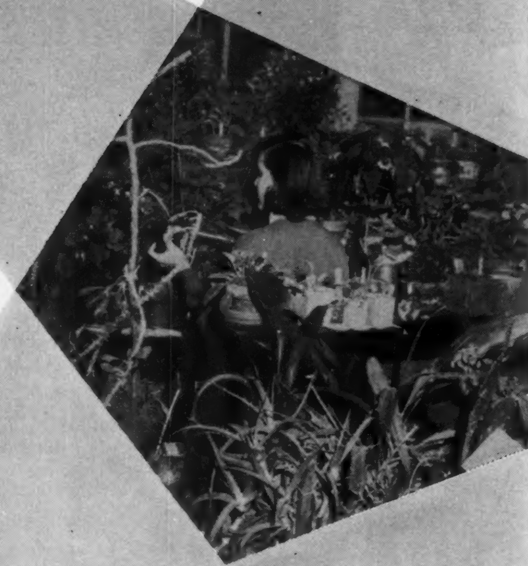
If I wish to explain "phototropism," I have only to walk to the window and hold up the oxalis plant with its leaves literally striving to touch the panes in order to get as much of the sunlight as possible; or if the term is "irritability," I touch an unsuspecting guinea pig on its back and invariably get a response.

Another advantage of "living" biology is to overcome groundless fears of harmless creatures, and a healthy respect for the few dangerous ones such as the black widow spiders. These spiders —both the harmless male and the quite dangerous female—are often brought in alive in the fall. They are fastened securely in plastic boxes and passed around the class. It is hard to convince students that these small black spiders are capable of inflicting more harm than our nonpoisonous snakes.

If a live bat is brought to class, I usually release it in the classroom where most students enjoy watching it dart and turn, dodging the wires stretched the length of the room. Only once have I seen a student disappear under her table thinking that the bat was swooping directly for her hair.

Reproduction of the higher animals and the laws of heredity are topics which develop naturally with the pregnancy of a guinea pig. How do the young develop? How long will it take? What color will they be? One question leads to another and soon we are applying the knowledge learned about guinea pigs to the study of reproduction

**Plant corner in the room**



and heredity among humans. If our guinea pig is considerate enough to have her young born during school hours, the class excitedly puts aside all other work and clusters around her cage.

Who actually takes care of all this living material? Actually, I do very little of it. Potted house plants are assigned to volunteers at the beginning of the year. Each is marked with a four-inch pot stick containing the name and class period of the student, and the student assumes complete charge of that one plant. Some students are woefully ignorant of the needs of a plant and have to be reminded to remove dry leaves, to provide sun, the right amount of water, a clean saucer. They learn to watch for insect pests such as white flies, mealy bugs, and red spiders.

Most of the animals are assigned for a week at a time. Sawdust and shavings are used for litter, and "pine" disinfectant does a remarkable job of combating animal odors. Rats, mice, and hamster cages are treated with the pine disinfectant daily. The litter of the rabbit and guinea pig cages is changed every day.

Vacations and long week ends present their special problems. Many of the animals go to students' homes, while the plants and the unwanted animals are cared for by a few students who volunteer to come to school at specified times about three days apart during vacations. When summer comes, the plants are set out in my garden, or put to rest under a shady tree, although some are given to the students who have cared for them.

New arrivals admired by visitors from the Junior High

Animals on students' tables are rotated weekly to provide variety

Just visitors to see the rabbit

Force feeding the hog-nosed snake

All during the school year they are taking "slips" of plants they admire. Many of the animals go to near-by summer camps, some are taken by students, the surplus rats and mice are put to "sleep" with chloroform, and a few special pets—such as the squirrel—spend the summer in my barn or on the porch of my home.

A question that might arise is the matter of financing a "living" biology room. Most of the cages are homemade. The most important food items are 100-pound bags of laying mash and scratch feed for the rats, mice, and hamsters and rabbit pellets for the rabbits and guinea pigs. These are covered in the department budget. Special rat diet foods for experiments are purchased commercially with our science supplies. Lettuce trimmings from a supermarket are given to all the furry animals and to the turtles. Stale bread comes from the cafeteria. Extras such as sunflower seeds, wheat-germ meal, cod-liver oil, and bird seed I buy as needed out of my own pocket. Veterinary bills are kept very low because of the kindness of a near-by veterinarian who treats our animals without cost except for medicine, and does autopsies when an animal dies of unknown causes. He is always willing to give us good advice and to help individual students with their problems.

One of my hobbies is photography and I am the advisor of a high school camera club. This makes it simple to secure pictures of the classroom and the activities that go on there. But I never seem to be able to quite catch the rapt expression on the face of a six-foot husky boy caught cuddling the friendly gray and white Dutch rabbit—a boy who doesn't even take biology but who comes in daily to see his animal friends. And how often have I seen traces of lipstick on some little white hamster or baby guinea pig. Many of these students would dearly love to take these animals home for vacations or buy them for their own, but often home circumstances prevent this and so I let them enjoy the animals while they can.

At the end of each school year I ask the students to evaluate the course in biology according to its content, method, text, and visual aids. I ask for comments as to the features liked best, those liked least, and constructive suggestions for improvement. Two "likes" which are repeated over and over again are the presence of the animals on the tables and the informality of the entire classroom situation. As one student expressed it last June, "Biology class doesn't seem like school; it is like home. I am not afraid when I come into biology class."

# SCIENCE PROJECT IDEAS

By **JOHN A. MANNING**

Northwestern State College, Natchitoches, Louisiana

EDITOR'S NOTE: This article will, we believe, prove to be the kind of "practical, immediately useful" item that many of our readers keep asking for. We wonder, also, whether it might not be the start of a chain reaction. We have in mind the many institutes and special programs for science teachers to be held next summer. Why not a report like this one, or other suitable variations, from each one? If you attend, keep *TST* in mind as the best way to relay your ideas to 20,000 other science teachers, who will be glad to exchange ideas with you.

A LIST OF ABOUT 40 PROJECT IDEAS for high school science students was compiled as an individual effort during the 1956 Shell Merit Fellowship program held at Stanford University. These projects were derived from lectures by men from industry and by the professors in the regular classes. During the lectures, when an idea "hit" me, I would jot it down and later expand it. An effort was made, of course, to write the suggestions so as to appeal to high school students and arouse their interest and desire to do projects. Dr. R. H. Eastman of Stanford's Department of Chemistry kindly read the entire list of projects and gave numerous suggestions for improvement. How well we succeeded may be indicated by the fact that 15 of the projects have already been selected and are being worked on by my students in the high school associated with our college.

These project ideas lend themselves to application of scientific method in its simplest form: (1) the problem, (2) library research, (3) making a plan or design, (4) carrying out the plan and collecting data, and (5) drawing conclusions. Used in this manner, projects provide one of the best learning devices in the science course. If the student is not required to follow some such plan, however, the project may degenerate into mere "busy work." A time schedule found to be effective in our school is as follows:

Phase 1: One to two weeks in which to decide upon a project.

Phase 2: Six to eight weeks of library research. The student hands in weekly reports or reference cards of his reading. Meanwhile, laboratory work is aimed primarily at developing techniques he will use in his project work.

Phase 3: Two to three months of working directly on the project. During this period the library research will continue of its own momentum and because the student finds it necessary in order to solve the minor problems connected with his project. Experimenting, collecting, building, and similar "doings" will, however, be the major activities.

Phase 4: Two to four weeks in which to write a report on the project.

If projects are treated as extra-class activities, the teacher will be amazed at the small amount of time needed to direct them, once the projects get under way. Usually a word of advice or of commendation is enough to send the student back to work with renewed vigor and confidence that he is on the right track toward a solution of his problem. Projects can, of course, be administered as part of the regular class work. This means that students must have access to the laboratory and that the teacher (or other qualified person) must be present. For projects to be completed at home, the teacher should do everything possible to anticipate and ward off any hazardous experiments.

Students should be encouraged to submit reports of their projects as entries in the American Society for Metals Science Achievement Awards program conducted by NSTA's Future Scientists of America (closing date, March 15). Seniors who are specially able in science should be encouraged to enter the Westinghouse Science Talent Search. If projects are to be entered in science fairs, the only additional problem in some cases is the one of display. Helpful suggestions regarding displays may be found in the May 1955 issue of *Chemistry*.

The following are selected project ideas from the list.

### Flow of Water Through Pipes

The flow of water through pipes is expressed by Talbot's formula which was devised before 1900. Road engineers badly need an improvement of this formula to make use of in road construction. Could you set up an apparatus to study the flow of water

through pipes? What factors would you consider? Shape of pipe? Length, surface, cross-sectional area? How could you measure the flow? Can you find out which type of pipe would be best?

### Velocity of Winds

Can the velocity of winds be determined by using sound waves? You will have to read and study about the transmission of sound before you start work. Factors to be considered include: speed of sound waves, a device to send out sound waves, a device to receive them, and factors affecting the speed of sound waves. Measurements with and against the wind will have to be taken.

### Variation in Concentration and Volume of Solutions

The problem is that the volume of the solute and of the solution changes as the temperature changes and that therefore temperature variations produce variations in concentration. This project will require careful planning as well as a good knowledge of solutions. The apparatus will require special attention because of the small volume changes to be measured.

A solution is composed of a solute and a solvent. One way of indicating the concentration of a solution is to give the per cent by weight of the solute in a given weight of solution. Another way is to give the per cent of solute by weight in a given volume of solution. The latter is the object of this project. Changes in volume with temperature changes are small, but the change in concentration, even of a small amount, is important to scientists. Hence the question: How does the concentration of a solution vary as the temperature is changed?

Can you devise an apparatus to measure the change in volume with the change in temperature? From this data can you calculate the change in concentration? Through what temperature range can you measure the change in volume? Can you make a graph of your results? *Suggestion:* Find the definition of "dilatometer."

**The result of doing science projects: Charles Lacefield, a student at Irvington, New Jersey, High School, won first prize in the chemistry division at the Greater Newark (New Jersey) Science Fair for his project on smog. This one tested the effects of fluorine on gladiolus plants.**

### Quality of Sound Waves

This project was suggested by Mark Jacobs, science teacher at Marysville, California. One of his students, a girl, carried on an extensive study of the qualities of sounds as shown by their wave shapes. She got a record and recording machine and arranged to have many different band instruments record the same note, say, middle C. Later she played this record through a pickup and amplifier to a neon tube whose variations, in turn, were sent to an oscilloscope. Thus it became possible to see the differences in the quality of the waves produced by the different instruments. What other studies of sound does this project suggest?

### Aging of Asphalt

One problem that plagues highway engineers is the aging of asphalt. After a few years the asphalt begins to crack and crumble. Can you find the answer? It would make a good study even if you don't find the final answer. What could cause the crumbling? Evaporation? Contraction and expansion? Weathering? Heat? Could you make a plan and devise equipment to make tests on asphalt?

### Extraction of Oils from Plants

Any plant leaf having an odor is likely to contain a volatile oil. Examples are pine oil from pine needles, wintergreen from mint, and clove oil. How are such oils extracted? Steam extraction is one method. Reading chemistry reference books will give you additional information. After reading, try some extraction yourself. How would you set up the apparatus? How long does it take to extract plant oils? How can these oils be purified? How can you determine the per cent of oil in the leaf? What are the characteristics of some oils—density, freezing points, viscosity, etc.?

The above projects are a sampling from the list I prepared last summer. If interested teachers will write to me, I will gladly answer questions and give additional project suggestions.

# a college look at HIGH SCHOOL SCIENCE

**By J. C. AMON**

**Department of Chemistry, Westminster College, New Wilmington, Pennsylvania**

IN 1955-56, one of our senior students conducted a questionnaire study to see if any reason could be found for the low enrollment in the physical sciences. Some 800 questionnaires were distributed among the students; 398 were returned. These showed that 350 students had taken biology, 302 had taken chemistry, and 202 had taken physics in their respective high schools.

The various combinations of science taken in high school are shown in the following table.

| | | |
|---|---|---|
| 152 | took | all three sciences |
| 114 | " | biology and chemistry |
| 65 | " | only biology |
| 25 | " | chemistry and physics |
| 17 | " | biology and physics |
| 13 | " | only chemistry |
| 7 | " | only physics |
| 5 | " | none except general science |

Of those who took all three courses, 63 per cent said they took biology because it was required, 32 per cent took chemistry because it was required, and 27 per cent took physics. This may have been due to the fact that many schools require at least one year of science above the ninth grade; some require two years, and in a few cases, all three are required.

The number of students who liked or disliked the various courses is indicated in the following table.

| | *Liked* | | *Disliked* | | *Tolerated* | |
|---|---|---|---|---|---|---|
| | No. | Per cent | No. | Per cent | No. | Per cent |
| Biology | 272 | 77.6 | 19 | 5.4 | 59 | 17.0 |
| Chemistry | 203 | 67.2 | 31 | 10.2 | 68 | 22.2 |
| Physics | 124 | 62.0 | 28 | 14.0 | 48 | 24.0 |

It appears that biology was the best liked course, while high school physics was the least liked of science courses.

### Some Comparisons

In order to get some comparisons, students who had taken all three courses were asked to tell which they liked best and which they liked least, with the following results.

The best liked were:

| | No. | Per cent of total (152) |
|---|---|---|
| Biology | 63 | 41.4 |
| Chemistry | 58 | 38.1 |
| Physics | 37 | 24.2 |

The least liked were:

| | No. | Per cent of total (152) |
|---|---|---|
| Physics | 50 | 41.5 |
| Biology | 40 | 26.1 |
| Chemistry | 35 | 22.8 |

The totals given do not add up to 152 but this is due to the fact that some students gave two subjects as most liked and others did not give any for the least liked. Again it appears that physics is the least popular of the three, except for the fact the percentage placing biology on the least liked list is larger than for physics. This might be accounted for by the fact that biology is selected by a greater number as their required science courses. The figures show that 63 per cent of the biology group took this course because it was required, while 68 per cent elected to take chemistry, and 73 per cent elected to take physics.

The reasons given for not liking a course, where all three had been taken, were tallied in categories.

The most frequently occurring ones were as follows.

| | Biology | Chemistry | Physics |
|---|---|---|---|
| Poor teaching | 16 | 12 | 14 |
| Not interesting | 5 | 6 | 9 |
| Didn't understand | 0 | 4 | 9 |
| Too much memory | 6 | 4 | 0 |
| Too little laboratory | 2 | 1 | 2 |
| Mathematics | 0 | 6 | 14 |

Poor teaching (in the opinion of students) seems to be quite an important factor.

When two or more years of science had been taken, the students were asked to give the course liked most and tell what they liked best and what they liked least about it. Since we were primarily interested in physics and chemistry, data were collected only for these. The aspect most liked and the number of students giving each answer follow for chemistry and physics.

| | |
|---|---|
| *Chemistry* | |
| Laboratory work | 49 |
| Good teaching | 15 |
| Interesting | 11 |
| Applications | 7 |
| Equations, problems | 8 |
| *Physics* | |
| Practical | 16 |
| Electricity | 6 |
| Laboratory work | 5 |
| Light and heat | 3 |
| Good teaching | 3 |

The least liked parts of their favorite course were:

| | |
|---|---|
| *Chemistry* | |
| Equations | 8 |
| Problems | 11 |
| Lack of equipment | 7 |
| Instructor | 6 |
| Didn't understand | 6 |
| Laboratory work | 5 |
| Memory work | 4 |
| *Physics* | |
| Problems | 7 |
| Mechanics | 5 |
| Lack of equipment | 2 |

Seventy students had taken neither physics nor chemistry and five of these listed general science as their only science. Of 65 who had taken biology, only 17 gave it as an elective; for the rest, it was a required subject. In answer to the reason for not taking physics or chemistry, less than half of these 65 replied; of these, 22 said "too difficult," four said "the teacher was poor," and three had "no room in schedule." When asked if they had any idea as to what was taught in these courses, 21 students said practically none, 42 said some. As the source of their information, 33 gave their fellow students, seven the teachers, and the rest indicated either hearsay or the family. Only two named the school's counselor.

Checking further on the counseling angle, we asked if there had been any organized attempt on the part of the advisors to acquaint the students with the course content in chemistry and physics and encourage them to enroll. Ten replied "some," while 51 said "none." The majority of students had no idea concerning opportunities available in these fields and the rest had only a vague idea.

Of the 114 students who took biology and chemistry, 97 said they had a pretty good idea concerning what was taught in physics. Seventy-two gave other students as the source of their information, 26 the teachers, and only three gave credit to the counselor. The reasons given for not taking physics were:

| | |
|---|---|
| Too much mathematics | 20 |
| Not interested | 15 |
| Too difficult | 15 |
| Didn't need it | 7 |
| Poor teaching | 7 |
| No room in schedule | 5 |
| Wrongly advised | 1 |

Again 89 reported no organized effort to acquaint them with content or to encourage enrollment. Twenty-six said there was some attempt; 19 of these gave credit to the counselor and the rest mentioned teachers, lectures, and science fairs.

The following comments about teachers are interesting.

"It's not the course that matters, it's the teacher. A course isn't appealing on its own merit, the teacher makes it appealing."

"Individual mathematics and science teachers discouraged students from taking higher courses."

"No one explained the courses. We had a counselor but a poor one. She bullied us into courses she thought best."

The overall picture indicates that there is no organized counseling attempt in more than 75 per cent of the cases.

There are a number of deductions that can be drawn from this limited study but these four appear to stand out:

1. A counseling program should be developed which will more fully acquaint prospective students with the nature of the physics and chemistry courses.
2. There should be a planned program whereby teachers can be secured who are specifically trained to teach these subjects on the high school level in a manner that will emphasize their practical values and make them interesting.
3. Laboratories should be equipped so that students can work on practical projects that will help develop interest.
4. A greater effort should be made by teachers to develop a more thorough background in the elementary mathematical concepts, especially of arithmetic and algebra.

# Selecting Objects and Specimens for Biology

By SAM S. BLANC

Gove Junior High School, Denver, Colorado

IN SCIENCE TEACHING we have long depended on direct learning experiences in science classes. As far back as 150 years ago, Pestalozzi and Froebel based their then revolutionary approaches to education on the use of objects and specimens in the school situation. By the same token, modern teachers depend in a large measure on the integrated use of these teaching aids in making the learning experiences of their pupils real and vital.

Objects may be defined as the actual forms of plants and animals themselves, either living or preserved. For example, in the study of microscopic life nothing equals the sensory impact produced by actually seeing the slow, purposeful flow of an amoeba, or the hurried, aimless darting of a paramecium. For a detailed study of the structure of these animals, however, mounted and properly stained forms will probably be more effective.

Specimens are objects, entire or in part, prepared and used as examples of the actual objects themselves. A mounted bird, a fossil, and a skeletal preparation may be considered as specimens. The line of demarcation may not at times be very sharp. Hence, the terms, *objects* and *specimens,* are often used together. The chief guide in their classification is that this type of instructional material usually includes those teaching aids which are designed to give pupils actual firsthand experiences with the topics being studied. This thought, of course, implies that pupils must always be encouraged to learn by means of direct sensory impressions gained by actually handling and manipulating the materials for study.

Since there are many types of objects and specimens available to the average biology teacher, and since there is a great deal of overlapping in the classification of these two types of teaching materials, the criteria for their selection may be considered together. The selection of these materials of instruction will usually not require the same degree of technical skill as will charts, models, films, and other more complex materials.

In many situations, the teacher and the pupils will find greater pleasure in organizing collecting field trips to bring into the laboratory a great variety of these materials which can be kept alive for immediate use, or preserved for future study. However, in a number of situations, such activities are not feasible. In that case, the teacher will have to depend on the many fine biological supply houses which specialize in furnishing these materials.

In setting up criteria for judging objects and specimens obtained for school use, several factors should be considered.

1. *Instructional Value:* The major thought that any teacher should have in selecting a given object or specimen is whether that aid will enable pupils to gain worth-while experiences not obtainable in any other way. Each teaching material must contribute unique experiences to justify its inclusion in the curriculum.
2. *Quality:* If living materials are ordered, the supplier should guarantee the arrival of the objects in a healthy condition. The catalog should be consulted to find out under what conditions such a guarantee is valid. If preserved specimens are ordered, they should be properly prepared and packed so that they are clean and firm when they arrive. It is discouraging for pupils to attempt a dissection and find the specimen partially decayed on the inside, or have it disintegrate on handling. Reputable supply houses state the size of the specimens, the method of preparation, and the method of packing for shipment in their catalogs.
3. *Accuracy:* In the selection of the whole object or specimen, accuracy obviously is not a large factor. If properly preserved, the tissues will be firm and true to their living condition. However, in purchasing such specimens as prepared microscope slides, the accuracy of the preparation and the care in staining and mounting will do much to increase the instructional value if done by experts.

### Preserved Materials

Preserved materials are available for use in studying all the common phyla of plants and animals. In selecting botanical and zoological specimens for class use, the care with which they are treated before and during preservation is of paramount importance. Poor techniques or incorrect preservatives will result in poor laboratory speci-

The value of carefully selected objects and specimens as teaching aids is evidenced by the intent atttiude of these biology students at Denver's East High School.

mens. Botanical materials should have been cleaned and dried, where necessary, before preservation. Killing in proper solutions is also essential to maintain correct relationships of internal structures. Zoological specimens should have been straightened and injected with preservatives to maintain internal structures in good condition. For critical study of larger forms, injections of special substances such as latex and dyes into the blood vessels and lymphatics will add much to the usefulness of the specimens.

Mounted plants, leaves, and flowers may be pressed, dried, and mounted on heavy sheets of cardboard to make worth-while specimens for class study. Mounts of this type are available commercially from biological supply houses as "herbarium sheets" mounted on 11½ x 16½-inch sheets with cellophane covers for protection. In addition to being able to supply any number of individual preserved specimens, most supply houses also furnish sets of botanical and zoological specimens for various sized groups of pupils. Catalogs may be consulted to find the particular species included in each set. It is up to the teacher to help select those which seem to be most appropriate.

### Fossil Specimens

In a unit dealing with evolutionary changes in organisms, fossilized specimens are excellent examples of life in the past. The average biology class is not interested in a specialized study of fossils. However, a comparative study of present-day forms of life in a given phylum might include fossilized specimens to give the pupils an idea of how these forms were related to organisms in the familiar world about us. Both botanical and zoological fossil specimens are available in boxed and keyed sets so that the teacher can use the specimens effectively.

An interesting teaching aid is offered by one company in the form of illustrated and explanatory fossil charts. These are complete study units consisting of actual fossil specimens mounted in place together with original drawings, descriptive diagrams, tables, and explanatory text. Each chart is a complete study unit which may be used either with or without the other charts in the series. Each display discusses the general biology of the group of plants or animals treated, the classification of the group, and its occurrence in the geologic timetable. These charts are printed on heavy white card and come in two sizes, 7¼ x 9½ inches and 12 x 18 inches.

### Living Materials

One of the finest ways of presenting to pupils the concept of the interdependence of living things is through the observation and care of a balanced aquarium. This can easily be developed by a group of pupils or the necessary supplies may be purchased. The following are some of the major types of aquaria possible in a biology room.

1. Fresh water vertebrate animal aquarium consisting of a variety of water plants, snails, aquatic newts, small turtles, fish, etc.
2. Fresh water invertebrate animal aquarium consisting of a variety of water plants, snails, small crustaceans, aquatic insect larvae, clams, etc.
3. Marine invertebrate animal aquarium consisting of sea water, starfish, sea urchins, small crabs, sea lettuce, etc.
4. Marine seaweed aquarium consisting of sea water and species of red and brown algae.

Terraria are useful to illustrate various types of habitats for the class.

1. Woodland terrarium consisting of plants and animals found in moist, woodland conditions, such as mosses, small ferns, liverworts, toads, tree frogs, salamanders, etc.
2. Desert terrarium consisting of plants and animals typical of a desert condition, such as cacti, horned toads, snakes, etc.
3. Insectivorous plant terrarium consisting of sphagnum moss, pitcher plants, sundews, etc.
4. Tropical terrarium consisting of plants typical of the Everglades region in Florida, such as small epiphytic orchids and ferns, lichens, clusters of Spanish moss, and clumps of true moss.

A number of units lend themselves readily to the use of living materials in the laboratory. For example, a great variety of protozoans are found in any pond or stagnant pool. With little effort a

teacher and pupils can grow mixed cultures of these interesting microscopic animals. If pure cultures of definite species are desired, supply houses are prepared to supply quantities suitable for class groups of any specified number. A study of the catalogs will show which types of protozoans are available in pure or in mixed cultures.

### Sources of Supply

Animals for use in aquaria, terraria, feeding experiments, and as just plain laboratory pets are available from a number of sources. If a state university is close, the zoology department may have a surplus of laboratory animals which it would be willing to donate or sell to the school. Insects in various stages of their life history may be obtained by organizing collecting field trips with groups of pupils. Any good biology workbook will furnish ideas for such a project. Such specimens brought into the classroom will enable pupils to watch the process of metamorphosis unfold before their eyes. Again, catalogs of the supply houses list specific animals available for purchase.

Many pupils will find a great deal of interest in raising and crossing fruit flies (Drosophila) to study the laws of inheritance. For simple experiments, wild fruit flies, collected at any fruit stand, will be adequate. However, if true conclusions are to be drawn from the experiments, pure strains of flies must be used. Such certified cultures are available from the usual sources of supply.

The culturing of bacteria is another interesting experience for pupils. A variety of nonpathogenic and pathogenic strains are obtainable as pure cultures. However, persons not familiar with bacteriological techniques should avoid bringing pathogenic forms into the laboratory. In general, if pathogenic forms are to be studied, prepared slides are much more desirable, and safer, for class use. A variation of these experiments is to investigate the effects of antibiotic molds on the growth of bacterial colonies. Supply houses will have the materials needed for these demonstrations.

### Microscope Slides and Preparations

Prepared microscope slides may be considered as special types of specimens. Microscopic forms of organisms may be mounted as entire plants or animals. Larger forms will be studied as sections or tissues. Practically all prepared microscopic materials are preserved, dehydrated, and stained to allow pupils to easily differentiate between various tissues in the mount. Almost all slides are standardized at 1 x 3 inches in size. In selecting these preparations, the teacher should be sure the work was done by an expert. A great deal of skill is necessary to prepare effective teaching materials on slides. Slides may be purchased in any quantity of specific slides, or special sets for beginning biology, botany, or zoology classes are available.

Some supply houses have developed special instructional materials based on microscopic preparations. The *Micro-Explano-Mounts* are permanent, self-contained units consisting of a microscope slide in a pocket on a card containing pertinent text and graphic information to explain the structures observed on the slide. These are available in sets of 25 for botanical or zoological subjects commonly studied at the high school level, or the mounts may be purchased on an individual basis.

*Bio-Plastic-Micro-Mounts* are special preparations of relatively larger plastic-embedded specimens calling for low-power study under a microscope or with a microprojector. These specimens are mounted in plastic disks which are cemented in a recessed position in suitable plastic holders, the same size as standard glass slides. These will make durable mounts, very resistant to scratching, soiling, and breaking.

Small and fragile specimens too large or too thick to be conveniently mounted on standard microscope slides may be had in the *Plast-O-Mount* preparation. These are embedded in blocks of plastic 1 x 3 inches in size, but, obviously, much thicker than ordinary slides. Plastic blocks should always be polished to a gleaming smoothness before the mounts are used under a microscope. These various preparations are available from biological supply houses carrying a variety of supplies and equipment.

**SPECIAL EVENTS AT CONVENTION:** For one, the **Membership Committee Luncheon**—time and place to be announced. All state and area directors as well as affiliate representatives are cordially invited to attend. Check the Convention Information Desk for details. For another, the special film showing of **Hemo the Magnificent**—4:30 p.m., Wednesday, March 20, Ballroom, Hotel Cleveland. It's a special pre-preview showing of the film prior to a special telecast on the CBS-TV nationwide network at 9 p.m. that evening. Other **special breakfasts** and **luncheons** are scheduled, including the **Life Membership Breakfast,** Saturday morning—check the Convention Information Desk.

# BACKGROUNDS in elementary science teaching

By ALBERT J. GENUA

Professor of Physical Science, State Teachers College at Westfield, Massachusetts

WHAT kind of background is necessary to teach science in the elementary school?

This is a moot question eliciting many different points of view. A survey of the literature in the field of science education indicates the scarcity of investigations dealing with the training of teachers for elementary science. The relatively few pieces of research in this field show the following.

1. In about two-thirds of the states it is possible for a teacher to be certified to teach in the elementary grades without having had any courses in science while attending college.
2. In all but five states it is possible for a teacher to act as a consultant in the teaching of elementary science without having had any academic credit in science while attending college.
3. Many critic teachers in the elementary training schools of teachers colleges lack adequate backgrounds in subject matter and methods of science. A good many such science teachers believe that science experiences are best treated incidentally in the program of social studies. In such cases, the major objectives of the teaching of elementary science may be disregarded.
4. Elementary student teachers generally find the typical subject matter courses in college science of little value in teaching elementary school science. Hence, where possible, they avoid such courses.
5. Elementary student teachers report that taking survey courses in the physical or biological sciences help in meeting the needs for subject matter in science.

From the foregoing it follows that teachers aspiring to teach elementary science in the elementary school should have the benefit of at least survey courses in the physical and biological sciences.

The course in physical science should be developed cooperatively by the science and education departments of the colleges and should be taught in the subject matter departments.

The course should be developed around the major objectives of science teaching as stated in the 46th Yearbook of the National Society for the Study of Education. These objectives are:

1. The attainment of functional information or facts.
2. The functional understanding of the important principles of science.
3. The development of scientific attitudes.
4. The development of skills in problem solving, or scientific method.

The topics for the development of these objectives should be selected from all fields of physical science: physics, chemistry, astronomy, geology, and meteorology and on the basis of the extent to which they are parts of the life experiences of the future elementary school teachers.

The course should provide experiences in the laboratory that will enable the future teacher to use common materials likely to be available in the elementary school.

The conditions applicable to the course in physical science apply equally to the survey course in biological science except that the topics should be chosen from the various areas of biological science: botany, zoology, health and safety education, and conservation education.

The two preceding survey courses should be

*(Please turn to page 99.)*

# The New Direction in Science Eduon

## *TOTAL EXPERIENCE PROGRAM POINTS THE WAY*

". . . science is surging ahead. Virtually every member of society will feel its impact. Science is working changes in our economy, our culture, our political concepts, our entire way of life — changes which not so long ago would have been considered fantastic beyond belief.

"These are the reasons for the broader program of science education instituted in modern schools. The goal of educators is to plan and equip the science room so that it meets, to a maximum degree, not only the technical needs of students who are directed towards science careers but also the orientation needs of others who share the world where science is omnipresent.

"Those who plan must consider long-range requirements — the demands that will be placed upon facilities for the next 20-30-40 years — as well as immediate needs. They must evaluate their objectives and include such facilities as will enhance their achievement. To provide equal opportunity in large schools and small schools, single rooms must be planned to serve all sciences in consecutive periods, or some in alternate years; suites of two rooms, perhaps, for the biological and physical sciences; rooms to serve a single subject; whole school plans which provide single purpose and multi-purpose rooms to care for fluctuations in need and enrollment without loss to a single child. All these must be planned without loss of a single function in a subject area, without loss of a single advantage in relation to the learning process; and without loss of any function contributive to the total program of the school."

*— Excerpt from "Science Education For All The Students," published and copyrighted by E. H. Sheldon Equipment Co.*

**GREATER ACCOMPLISHMENT FOR YOU AND YOUR STUDENTS IN A SHELDOPPED**

# SUMMER RESEARCH ASSISTANTSHIPS FOR SCIENCE TEACHERS

## An NSTA Staff Report

Colleges, universities, and industrial laboratories are continuing to offer science teachers the opportunity to do summer research work. It is recognized that these research assistantships are mutually beneficial: they not only give the science teacher the chance to do research — satisfying work, in itself — and to gain thereby for future teaching, but they also provide the industrial laboratory technicians with a firsthand knowledge of teachers' techniques and problems.

The following summary of summer research assistantships for science teachers lists information received at magazine press time. This summary, provided by the Future Scientists of America Foundation of the National Science Teachers Association, is printed here as a professional service.

In terms of numbers, there are fewer assistantships than were announced as available about this time last year for the summer of 1956. However, there are certain factors to take into consideration. One is that the number of summer institutes—some 95 of them alone supported by the National Science Foundation—has greatly increased this year as compared to last. (See the summer institutes listing in the February issue of *TST*.) The fact is that with such expanded programs as those of summer institutes, the summer opportunities for science teachers of one kind or another are far more numerous in 1957 than in previous years. Probably, these opportunities will be multiplied by a factor of five or more over any previous summer in history. NSTA's estimate is that fully 5000 science teachers will be investing their summer in programs of fellowship support or specially designed offerings from colleges, universities, and industrial and other research laboratories.

The following listings of summer research assistantships give the name of the institution offering the program, the name of the person to contact, number of assistantships available, field of research, qualifications specified, hours, remuneration, and other pertinent data, in that order.

**American Gas Association, Inc.,** 1032 East 62nd Street, Cleveland 3, Ohio. E. L. Bangert, Personnel Director. One research assistantship in the field of development and improvement of fuel gas burning appliances and equipment for residential and commercial use. Applicant must have qualifications to be a science teacher. No particular skills required but a desire to work with mechanical tools helpful as well as hobbies such as photography and electronics. Forty hours per week for duration of the teacher's vacation. Remuneration: $275 to $325 depending upon qualifications and experience. No housing or courses provided.

**Boston University,** 725 Commonwealth Avenue, Boston, Massachusetts. Dr. F. Dow Smith, Chairman, Physics Department. Two or more in the fields of optics, photographic physics, and/or communication theory. Bachelor's degree in mathematics, physics, or chemistry. Electronics, mathematics, instrumental work. Up to 40 hours per week. From $350 per month.

**College of the Pacific,** Stockton 4, California. Dr. Emerson Cobb, Chairman, Department of Chemistry. Two in the fields of atomic structure, organic synthesis, natural plant products, instrumentation, and carbohydrates. Bachelor's degree with chemistry major. Ability to direct a section of a beginning organic laboratory. Two sessions of five weeks, which may be applied for separately. Tuition plus. Housing available; complete curriculum of graduate courses for a master's degree.

**Cornell University,** Ithaca, New York. Dr. Philip G. Johnson, Stone Hall. At least six research assistantships, details now being worked out.

**Illinois Institute of Technology,** 3300 South Federal Street, Chicago 16, Illinois. Dr. Martin Kilpatrick, Chairman, Department of Chemistry. One in chemistry. A BS with a major in chemistry. Interest and aptitude for experimental research. Minimum of 21 hours of research per week for two months. $450. Campus housing available; certain mathematics and physics courses available.

**Indiana University,** Bloomington, Indiana. Dr. Ralph E. Cleland, Dean, Graduate School. One in physics, chemistry, botany, zoology, or mathematics. Equivalent of an undergraduate major or more. Eight weeks with a minimum of 25 hours per week. $400. University housing available.

**Miami University,** Oxford, Ohio. Prof. Howard Ritter, Chairman, Department of Chemistry, and Prof. J. Fisher Stanfield, Chairman, Department of Botany. Five research assistantships, one or two in botany and three or four in chemistry. Applicants in chemistry must have sufficient knowledge to do the work; in botany, ability to identify specimens and work in herbarium. Ten weeks. $400 each. University housing available.

**Michigan State University,** East Lansing, Michigan. Dr. Thomas H. Osgood, Dean, School for Advanced Graduate Studies. One or two assistantships in physics. Details being developed.

**Oregon State College,** Corvallis, Oregon. Dr. F. A. Gilfillan, Dean, School of Science. Possibly three in chemistry, soils, and physics. Eight weeks of approximately 20 hours per week. $455. Housing available; seven credit-hours work expected.

**Polytechnic Institute of Brooklyn,** 99 Livingston Street, Brooklyn 1, New York. Howard P. Wile or Prof. S. V. Nardo, Associate Professor of Aeronautical Engineering. One or two in analytical and experimental research in structures and aerodynamics. Engineering degree preferred; possibly can use applicant with physics background. Ten to 14 weeks, 40 hours per week. From $350. Limited summer session courses.

**Purdue University,** Lafayette, Indiana. Prof. Ralph W. Lefler, Physics Building. One each in biological science and physical science. Eight weeks. $500. May take one course in regular summer session.

**Rensselaer Polytechnic Institute,** Troy, New York. Prof. G. H. Carragan, Head, Department of Physics, and Prof. J. B. Cloke, Head, Department of Chemistry. One in chemistry or physics. Major or BS degree in chemistry or physics. Eight weeks, July 1-August 24. $400. Summer courses available.

**Texas College of Arts and Industries,** Kingsville, Texas. Dr. Olan Kruse, Chairman, Department of Physics. Two in physics. Bachelor's degree in a scientific field. Part-time teaching, research in chosen field. Six or 12 weeks with 15 hours per week. $150 per month. Student dormitory rates.

**University of Akron,** Akron 4, Ohio. Dr. Thomas Sumner, Head, Chemistry Department. Tentatively one in polymer chemistry. Laboratory experience helpful. Forty hours per week, number of weeks to be arranged. $275-$300 per month. Extensive course offerings in College of Education, a few graduate chemistry laboratory courses.

**University of Colorado,** Boulder, Colorado. Dr. Albert Weaver, Chairman, Department of Physics, and Dr. Robert Pennack, Acting Chairman, Department of Biology. As many as five in physics and biology. An undergraduate major or equivalent, if possible some graduate or specialized training in the field chosen by the applicant; Master's degree desirable, or some progress toward it. Sufficient training and experience for research work. Ten weeks from 20 to 40 hours per week. $900 to $1000 for full-time, or fraction thereof depending upon program of courses and research work. University or off-campus housing available.

**University of Illinois,** Urbana, Illinois. Miss Antoinette La Voie, Graduate College, 109 Administration Building (E). Two in the physical and biological sciences. Eight weeks, 20 to 40 hours per week. $400. Courses available, tuition free.

**University of Maryland,** College Park, Maryland. Dr. John S. Toll, Head, Physics Department. Six in various physics fields. Bachelor's degree and research experience and/or advanced training in mathematics, special knowledge of electronics. Hours adjusted to needs of the assistant. $250-$360 per month for full-time work, part-time work prorated. Summer school courses available.

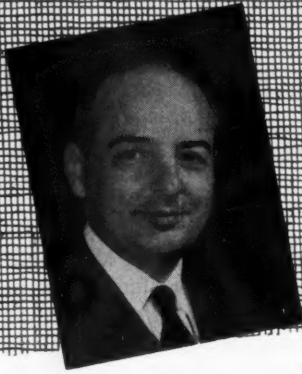
**University of North Dakota,** University Station, Grand Forks, North Dakota. J. Donald Henderson, Associate Professor of Physics. One in plant ecology. Undergraduate major in biology, preferably with some work in systematic botany. Approximately nine weeks. $300. Dormitory rooms available; research programs and courses to be arranged with the assistant as program is developed.

**University of Pittsburgh,** Pittsburgh 13, Pennsylvania. Dr. Max A. Lauffer, Dean, Division of Natural Sciences, George Hubbard Clapp Hall. Possibly two in chemistry, physics, biophysics, biological sciences, or psychology. Undergraduate major in one of these fields. Approximately eight weeks, 20 hours per week. Approximately $2.50 per hour. Summer courses available.

**University of Redlands,** Redlands, California. Dr. R. J. Krantz or Dr. R. H. Maybury, Department of Chemistry. One in physical chemistry of proteins or preparation and characterization of the tertiary nonyl alcohols. At least BS in chemistry. Ten weeks, 40 hours per week. Remuneration to be worked out with teacher.

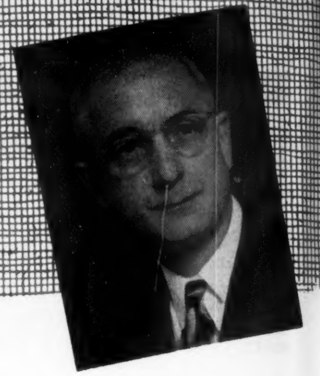
**University of Rochester,** Graduate School, Rochester, New York. Dean Lewis W. Beck, Graduate School. Possibly three in physiology, physics, and anatomy. For physics, some interest or experience in electronic techniques; for physiology, laboratory experience desirable. Two months, full-time. $200-$235 per month. Possibly one summer school course available to research assistant.

**Vanderbilt University,** Nashville, Tennessee. Dr. Robert Lagemann, Chairman, Department of Physics and Astronomy. One in observational astronomy. Strong interest in astronomy, preferably at least one college course in astronomy. Some laboratory experience desirable, especially in photography. Ten to 12 weeks, 30 hours per week. $200 per month. Dormitory space available for single person. Car necessary, observatory eight miles from campus. Much of work to be done at night.



ARTHUR S. FLEMMING, *President*, Ohio Wesleyan University, Delaware, Ohio; formerly *Director*, Office of Defense Mobilization, Washington, D.C., on leave of absence from Ohio Wesleyan. As keynoter for the Wednesday theme, *Frontiers in National Security*, he will talk on "Elements of National Security," at the opening session.

LESLIE W. KNOTT, U.S. Public Health Service, Department of Health, Education and Welfare, Washington, D.C. Speaker on "Health and the National Security," Wednesday afternoon.

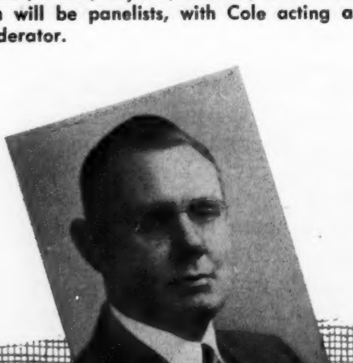


J. CARROLL PHOTO

M. H. TRYTTEN, *Director*, Office of Scientific Personnel, National Academy of Sciences, National Research Council, Washington, D.C. Speaker on "Human Resources and the National Security," Wednesday afternoon.

# NSTA 5th Annual National CONVENTION

JOHN H. FISCHER, *Superintendent*, Baltimore, Maryland, Public Schools. He will deliver an address on "National Security and Science Teaching," Wednesday evening. In the panel discussion following, Fischer, Knott, Trytten, Barnett, and Glennan will be panelists, with Cole acting as moderator.



I. BERNARD COHEN, *Professor of the History of Science*, Harvard University, Cambridge, Massachusetts. He will speak on "The Impact of Science on Society," at the general session Thursday mornnig.

WALTER R. FLEISCHER

KENNETH A. MEADE, *Director of Educational Relations*, Public Relations Staff, General Motors Corporation, Detroit, Michigan. He will speak on "Science Education Today for Tomorrow," at the Thursday luncheon session.

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REBMAN PHOTO SERVICE

**CHARLES C. COLE, JR.,** *Assistant Dean,* Columbia College, Columbia University, New York City. Discussant on "Human Resources and the National Security," Wednesday afternoon.

**HAROLD J. BARNETT,** *Director,* Economic Growth Studies, Resources for the Future, Inc., Washington, D.C. Speaker on "Natural Resources and the National Security," Wednesday afternoon.

**T. KEITH GLENNAN,** *President,* Case Institute of Technology, Cleveland, Ohio. Speaker on "Industrial Resources and the National Security," Wednesday afternoon.

# N HIGHLIGHTS

## Cleveland · March 20-23

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Education
Thursday

**DENNIS FLANAGAN,** *Editor, The Scientific American,* New York City. At the general session Friday morning he will present the viewpoint of the educated layman—alert to science but not a scientist.

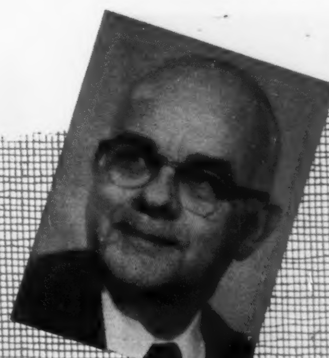
**PAUL B. SEARS,** *Professor of Conservation and Director,* Graduate Program in Conservation Education, Yale University, New Haven, Connecticut. His approach will be from the fields of biological science and conservation. Friday morning.

**LAURENCE H. SNYDER,** *Dean,* Graduate College, University of Oklahoma, Norman; *President,* American Association for the Advancement of Science. His topic is "The Rationality of Some Intuitive Foundation Stones," at the annual banquet Friday night.

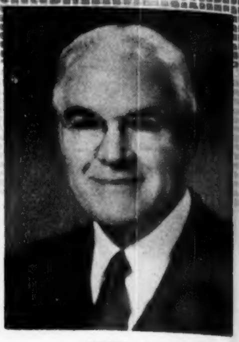
ROY STEVENS

ALBURTUS—YALE NEWS BUREAU

UNIVERSITY OF OKLAHOMA



MICHIGAN STATE UNIVERSITY



REBMAN PHOTO SERVICE

**CHARLES DAMBACH,** *Director,* Natural Resources Institute, The Ohio State University, Columbus. Moderator for "Natural Resources and the National Security," Wednesday afternoon.

**PAUL L. DRESSEL,** *Professor and Director of Education and Evaluation Services,* Michigan State University, East Lansing. At the general session Saturday morning he will talk on "Selecting Subject Matter in Science."

**ELMER HUTCHISSON,** *Dean,* Graduate School, and *Director,* Research Division, Case Institute of Technology, Cleveland, Ohio. He will present the viewpoint of the physical scientist, Friday morning at the general session.

**ABRAHAM RASKIN,** *Coordinator of Teacher Education in School Science,* Hunter College, New York City. Thursday evening, as secretary of the STAR awards program, he will present the $200 cash awards and medallions to the 60 teachers whose entries were selected from 306 submitted in the program.

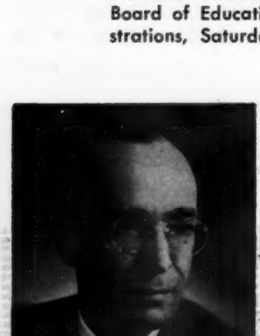
# HIGHLIGHTS

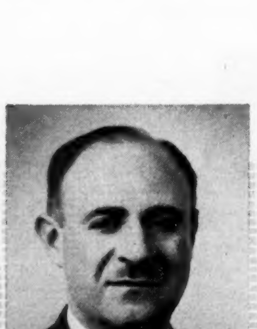
**NELSON F. BEELER,** *Professor of Science,* State University Teachers College, Potsdam, New York; author of numerous science books for children. General science demonstrations, Saturday afternoon.

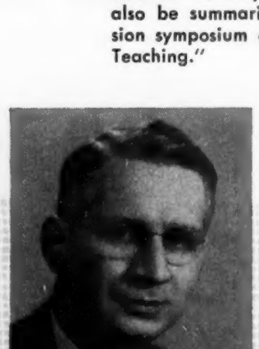
**CHARLES D. TANZER,** Bureau of Curriculum Research, Board of Education, New York City. Biology demonstrations, Saturday afternoon.

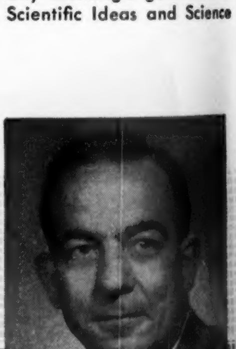
**JOHN S. RICHARDSON,** *NSTA President,* Professor of Education, The Ohio State University, Columbus. He will preside at Wednesday's opening session, will be chairman of the CBIR-sponsored symposium and demonstration Thursday afternoon, and will be toastmaster at the annual banquet Friday evening.

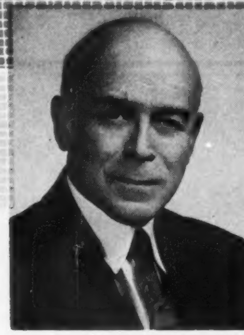
**ROBERT STOLLBERG,** *NSTA Retiring President,* Professor of Science and Education, San Francisco State College, California. As CBIR chairman, he will preside at Thursday's CBIR-sponsored luncheon. He will also be summarizer at Friday morning's general session symposium on "New Scientific Ideas and Science Teaching."



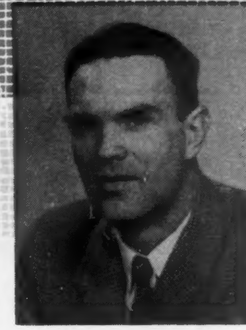








CLARENCE L. MYERS



**VERNON C. LINGREN,** *Professor of Education,* Director of Student Teaching, University of Pittsburgh, Pennsylvania. Saturday morning speaker on "Selecting Instructional Methods in Secondary School Science."

**CLARA E. COCKERILLE,** *Assistant Superintendent,* Armstrong County Public Schools, Kittanning, Pennsylvania. Speaker on "Selecting Instructional Methods in Elementary Science," Saturday morning.

**J. ARTHUR CAMPBELL,** *Program Director for Summer Institutes,* National Science Foundation, Washington, D.C.; formerly *Professor of Chemistry,* Oberlin College, Oberlin, Ohio. Chemistry demonstrations, Saturday afternoon.

**RICHARD M. SUTTON,** *Professor of Physics,* Management Development Program, Case Institute of Technology, Cleveland, Ohio. Physics demonstrations, Saturday afternoon.

**NEWTON SPRAGUE,** *Consultant in Science and Mathematics,* Indianapolis, Indiana, Public Schools. Thursday afternoon in a special program dealing with Indianapolis' community-wide effort to strengthen the junior high school general science program, he will demonstrate one of the new mobile laboratories designed and built within the city's school system. Sprague, right, is shown here conducting an experiment in one of the laboratories. There are now 72 in Indianapolis; one will be on display at the convention.

INDIANAPOLIS TIMES

**GLENN O. BLOUGH,** *NSTA President-elect,* Associate Professor of Education, University of Maryland, College Park. He will preside at the final general session Saturday morning and will be the speaker and discussion leader at the Saturday afternoon "Here's How I Do It" demonstration session on elementary school science.

**JAMES G. HARLOW,** *Convention Chairman,* on leave as Professor of Education at the University of Chicago, Illinois, currently with Frontiers of Science Foundation, Oklahoma City, Oklahoma. He will open the convention at 1:30 p.m., Wednesday and will preside at Thursday morning's general session.

**GEORGE D. LOBINGIER,** *Manager,* Westinghouse Educational Center, Westinghouse Electric Corporation, Wilkinsburg, Pennsylvania. Moderator for discussion on "Industrial Resources and the National Security," Wednesday afternoon.

**ARTHUR O. BAKER,** *Convention Chairman of Local Arrangements,* Directing Supervisor of Science, Cleveland, Ohio, Public Schools. He will introduce local committee chairmen at Thursday evening's general session and preside at Saturday afternoon's biology demonstrations session.

FABIAN BACHRACH

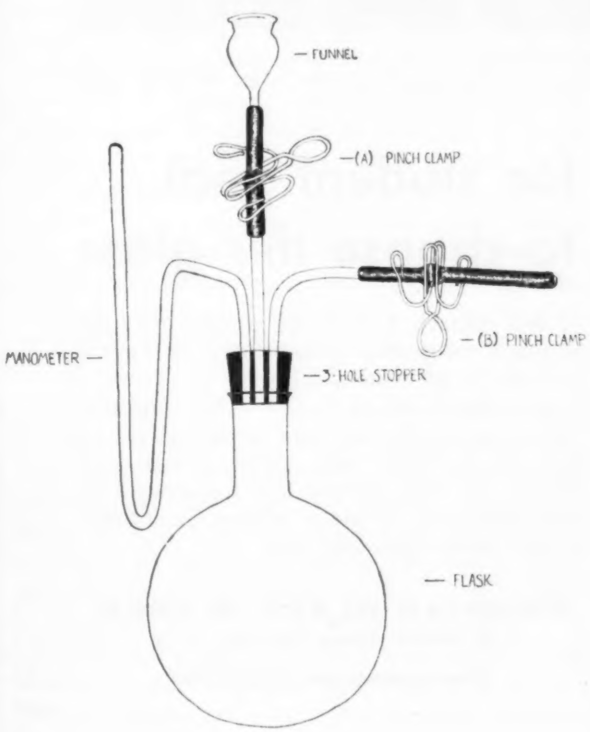
# Classroom Ideas

## Physics

### Vapor Pressure

By RICHARD F. BLAKE, Stratford, Connecticut, High School

Vapor pressure is a difficult phenomenon to demonstrate to students, for most vapors are invisible and it is difficult to show that they do exert "push" that is separate from atmospheric pressure. Yet this vapor pressure is one of the best facts that can be used to support the kinetic-molecular theory. The following demonstration is not entirely original but it is so simple and effective that it deserves wide use in the physics classroom. It can be carried out with easily obtained equipment and does not require much in the way of expense or time.




Apparatus: A one-liter florence flask (any bottle will do) is fitted with a three-hole stopper. One hole is fitted with a manometer (U-shaped glass tube with colored water), one with a funnel and pinch clamp, and one with a glass tube and pinch clamp.

Procedure: PART I.

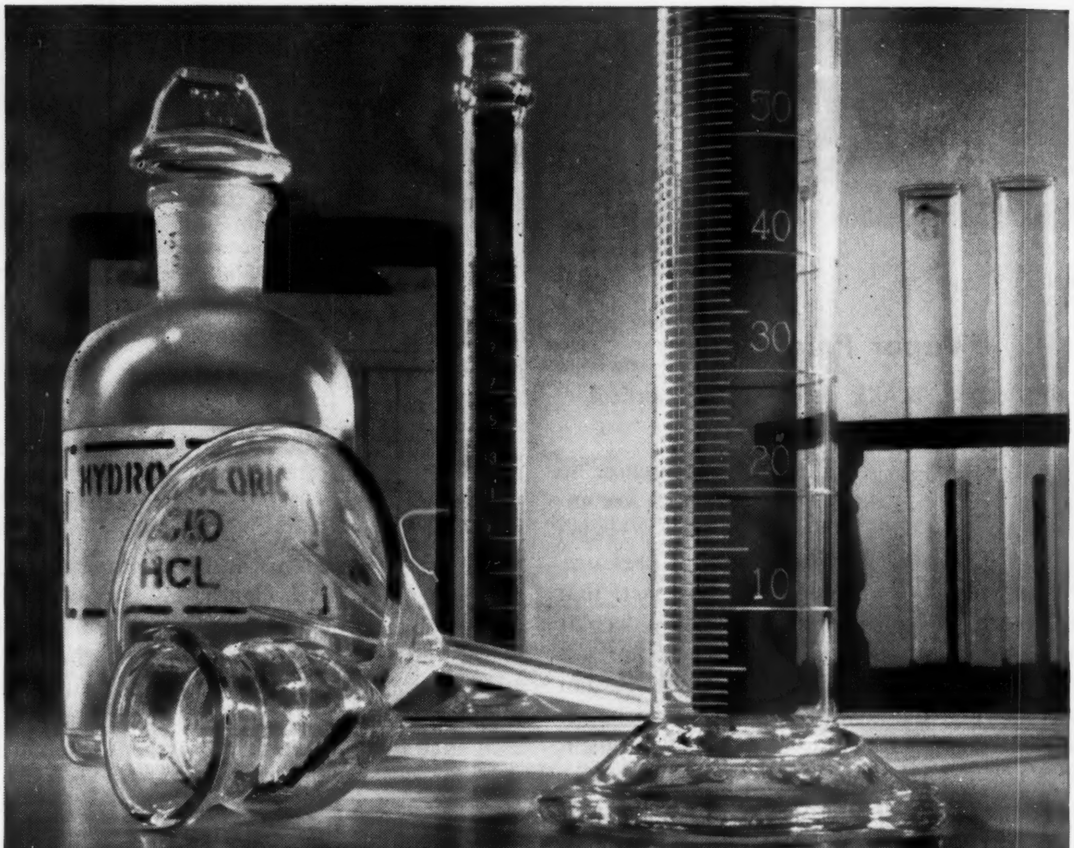
Point out that the water in both tubes of the manometer is at the same level. Point out also that if any water is added to the flask from the funnel, a slight displacement of air might increase the height of water in the far arm of the manometer, but if the pinch clamp "B" is open the air is allowed to escape and no pressure will be caused in the flask. Now with both pinch clamps open, add about 10 ml. of water through the funnel and then immediately close both pinch clamps. The manometer will show a gradual increase in pressure for several minutes due to the water vapor forming in the flask.

CAUTION: The flask must be *dry* at the beginning of the demonstration. Do not touch the flask with your hands or the temperature increase will cause the manometer to show an increase in pressure.

PART II. If the pinch clamp "B" is now opened, the pressure inside the flask will again become equal to atmospheric pressure and the manometer will again have an equal height of water in each tube. Part of the pressure in the flask, however, is water vapor pressure. If the process is repeated, it can be shown that no additional pressure will be formed. This is interpreted to mean that saturated water vapor pressure is a constant at a constant temperature.

PART III. Now with the water still in the flask, add about 10 ml. of alcohol as in Part I. The manometer will show a definite increase in pressure. This shows that alcohol has a greater vapor pressure than water. You may wish to discuss the reason based on molecular structure or the effect on certain properties such as boiling and freezing points.

PART IV. If desired, the entire process can be repeated using materials that are progressively more volatile. The results will be found to be equally effective.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## General

# A Water Barometer

By WILLIAM CARLSON, Wilson High School, St. Paul, Minnesota

A practical and simply-designed water barometer was made with a clear plastic garden hose 50 feet long. The lower end was coiled into a bucket of water and placed outside the building. The upper end was pulled to the top of a third floor window. The air pressure pushed the water up to a height of 31 feet. It was necessary to cap the lower end several times and refill the upper end so as to let out dissolved air. A rubber stopper was used to plug the upper end while a metal screw cap made the lower end tight.

## Elementary Science

# Tips to Science Teachers

By JOHN F. ETTEN, Science Department Chairman, Parker Elementary School, Chicago, Illinois

Good science teaching results when teachers are convinced that they are providing a thorough, well balanced program for their pupils. The following suggestions have evolved from discussions among teachers of experience.

1. Plan the semester's work in a broad general way to include a vast range of material. Provide for individual differences, projects, current scientific data, research, and possible work for the superior youngster. The individual units should incorporate the more specific details such as the objectives, problems, excursions, audio-visual aids, classwork, and evaluation. Study the community for possible sources of science specimens and field trip locations.

2. Establish a working calendar which would list dates when assignments were due on the following bases: topics selected, dates of progress reports, date of final project sketch and outline, date of final presentation to the class, and date of exhibition for other students in the school. This not only makes more efficient use of the pupils' time but also aids the teacher in planning.

3. Prepare a roster of community experts and advanced science students who can serve as advisors or consultants for the youngsters in your class.

4. At the beginning of each new unit exhibit and discuss projects undertaken by former pupils.

Discuss the problems involved, methods and materials of construction, and the possibility of similar or new projects.

5. Join a local and national science association to keep abreast with new teaching aids, techniques, and procedures. Recommended locally is the CTSA (Chicago Teachers Science Association) and nationally the NSTA (National Science Teachers Association). The NSTA sends frequent packets of teaching aids and the *Elementary School Science Bulletin,* which have proven most helpful.

6. Begin a periodicals rack for circulation of current science magazines, brochures, and leaflets. During free study periods or for home study, let the children check out these materials.

7. Start a vertical file with newspaper and magazine clippings, pictures, brochures on careers, commercial resource materials, and other visual aids.

8. Sponsor a science fair to encourage students with science interests to go further with their investigations. Children learn much in the display of their talents and can exchange ideas with peers when viewing projects. These early beginnings can lead to permanent hobbies or vocations.

9. Add a science page in the school paper.

# NSTA Activities

## Waiting Time

"Going-to-press" with the March issue of *The Science Teacher* is usually a kind of "waiting time" for this column, and this year is no exception. NSTA headquarters in Washington are a-buzz, it's true, what with the last minute planning for Convention, with frantic rushes to meet deadlines on programs, reservations, etc. But for this column, it's definitely sluggish. Big news *is* coming up. But it can't be announced until *TST's* next issue, after the news has first been told at Convention in Cleveland. Will you be there to hear it?

What news, for example? Well, such as: Who are going to be NSTA's new officers and replacements on the board of directors? Who are the STAR award winners? What's all this about a new NSTA Commission on Education in the Basic Sciences? What are plans for next year?

These and more developments will be announced in Cleveland—*remember the dates, March 20 through March 23*—but for those of you unable to attend Convention, there'll be a report next month.

## In the Meantime

In the meantime, NSTA activities go on, of course. Cleveland is a milestone in this year's calendar, but post-Cleveland meetings are getting a lot of attention, too. These include the Denver meeting in March 1958—NSTA's 6th National Convention—and some important regional meetings in between. Convention is important, but if it is impossible for you to attend, the regional meetings are also stimulating.

These are dates to keep in mind: *June 24 and 25, 1957* for the Northwest regional meeting at the State College of Washington, Pullman; Dr. Alfred Butler, of State College, is chairman of the committee planning this session. *July 1* is the date of the annual summer meeting to be held this year in Philadelphia in conjunction with the NEA Centennial Convention. This will be a joint meeting with the National Council of Teachers of Mathematics, and Dr. Walter S. Lapp, head of the science department at Overbrook High School, Philadelphia, is handling NSTA planning for this session. A third important regional meeting is the Northeast regional conference scheduled for *October 18 and 19* at Hartford, Connecticut. The initial planning for these sessions has been under the direction of Dr. Frederick McKone, of Teachers College of Connecticut at New Britain.

Whichever of these regional meetings you can go to—because you will be near—the meeting will be instructional, as well as fun.

## Membership

The NSTA membership roll continues to grow at a steady pace. When last reported in this column in the October *TST*, membership had gone over the 10,000 mark. By early February, the number had increased to more than 12,000.

Interesting, indeed, are some of the comments that come in with membership applications, giving the reasons for joining. With some, *TST* sparked their desire to join; with others, it was the *Elementary School Science Bulletin* or other NSTA materials. In some cases, a fellow science teacher aroused interest. In several instances, teachers who decided to submit STAR entries thus became acquainted with NSTA and decided to join.

One new membership, which arrived early in February, especially delighted the NSTA staff, because it means the Association has gone behind the Iron Curtain. It's a library subscription from an academy in Moscow—the first, according to NSTA records, from the Soviet Union.

## Publications

The "back room" at NSTA headquarters is newly-shelved, a step that was necessary to keep the working stocks of NSTA publications readily accessible. Filling orders for these publications is one of NSTA's major though lesser known activities. Dozens of orders are filled each day and the weekly average ranges above 500. The publications report on a wide variety of subjects of interest and importance to science teachers and science students—bibliographies, career guidance and student project pamphlets, science teaching ideas, and many more.

A best seller is the Bruce books, so called because their author is Guy V. Bruce, Professor Emeritus of Science, New Jersey State Teachers College, Newark. These are a set of seven volumes formally titled "Science Teaching Today." They're a series of practical teaching aids on experiments and experiences with water, air, sound, etc. The booklets are 75¢ each;

the set of seven is $4.50. Sales of the Bruce books have now gone over the 50,000 mark. That's a record—even at NSTA.

There's an NSTA listing of Publications. If you don't have one, write to NSTA for it, 1201 Sixteenth Street, N.W., Washington 6, D. C. If you haven't seen this sheet, you'll undoubtedly be pleased to learn what interesting and helpful publications the Association can provide for you.

## *Materials for Meetings*

This is a plea to teachers and others who ask NSTA for display and other materials for use at district, county, and state meetings of science teachers. NSTA is glad to supply these materials whenever possible. But, too often, the requests come in as late as a week before the scheduled meeting.

It normally takes at least a month to fill these requests—assemble the desired materials, arrange for their packaging, get them shipped out, etc.

You can always figure that, when your requests come in, they will be taken care of as soon as possible. But NSTA's headquarters are not as spacious as we would prefer—so we cannot stock all items.

So *please* get in touch with NSTA as soon as dates are set for your meetings and you know what you'll need from us.

# FSA Activities

## SAA: Final Call

As of press time, there are barely three weeks before it's "final call" for entries in the 6th annual Science Achievement Awards Program for students. *March 15 is the deadline.* If you have students with projects under way and they haven't finished them yet, be sure the entries get into the mail by March 15. They must be mailed to the geographic region chairman.

Last year there were close to 1000 winners in the program, including honorable mention—from the eight geographic regions in which the awards are made. This year again the value of all the awards totals $10,000. There are 140 awards of U. S. savings bonds, including 20 Special National Awards of $100 savings bonds each for projects dealing with metals and metallurgy. In addition, there are gold pins, plaques, and certificates.

As plans now stand, the 1956 SAA winners of the 140 awards will be announced in the May issue of *TST*. This announcement will be followed by a brochure listing all winners, probably, as last year, with a breakdown of geographic regions.

## Research Assistantships

Pages 78 and 79 of this issue of *TST* carry a listing of summer research assistantships as announced by press time. This listing is one of the services provided by FSAF in its activities to help develop summer opportunities for science teachers. FSAF's role is purely catalytic; it is to make every possible effort to encourage colleges to provide summer research jobs, and, at the same time, try to keep teachers informed of these opportunities.

You, as teachers, should contact the sources listed in this issue of *TST*. But there are other facts you should know: In making our survey, we found that quite a number of institutions did not think it advisable to take advantage of a *TST* listing because the opportunities they're offering are purely local as well as limited in number. Therefore, check your local colleges and universities, lest you miss an excellent opportunity in your own neighborhood.

FSAF also needs help from you. If you do take advantage of a summer research assistantship this year, we would like to know your assessment of it. After you've had this experience, please write us what you think are the negative (if any) as well as positive values. Please be frank; we won't quote *you*.

We'll be glad to have your report, particularly after you've had a little time to evaluate your reactions. Write to the Future Scientists of America Foundation, National Science Teachers Association, 1201 Sixteenth Street, N.W., Washington 6, D. C.

The essential point to remember is that if this program has value—mutually to science teachers and to industry—we want to help keep it going. If, however, you with personal experience think it of little or questionable value, we want to know that, too. Basically, it comes down to the fact that FSAF should expend its energies where they can help most effectively to improve science teaching and the development of future scientists for every science field from research and teaching to jobs in industry.

## Plans and Programs

It's a big—and good—year ahead for FSAF if present plans can be carried out. Aside from the basic projects and the long-standing program of Science Achievement Awards for Students, there are such special projects as the study on research grants for high school science teachers and the summer conferences. An example of the latter, of course, is the West Coast High School Chemistry Teachers Summer Conference (outlined in the February issue of *TST*), which will be sponsored by the Crown Zellerbach Foundation in cooperation with FSAF and San Jose, California, State College, the host college this year. A second such FSAF conference this summer will be held at the University of Maryland, co-sponsored by the West Virginia Pulp and Paper Company.

Industry's cooperation is, of course, necessary in the carrying out of FSAF plans. Right now, FSAF officers are hard at work presenting the plans and programs to industry representatives in order to help get the needed financial support. The budget figure is $141,500—actually a modest amount considering the objectives of the program. It's even more modest when reduced to certain mathematical equations such as the cost per U. S. science teacher. That would be about $1.50 per teacher. And in terms of U. S. high schools, it would be less than $5.00 per school for all the high schools in the United States.

## NICOLETTE—continued from page 61

One of the visitors noticed a lighted sign, *General Science*. The group entered the classroom as the instructor was demonstrating the basic parts of the historic vacuum tube. The visitors were amazed that the vacuum tube was still a subject of study. The principal explained that even the later-developed transistor is now outmoded, but the vacuum tube, like so many other devices that have outlived their usefulness, still persists as a major item of study in the curriculum. This, the principal continued, is because an understanding of the outmoded devices contributes a great deal to an understanding of the current ones.

Each student was seated at a desk that resembled a large television set standing on end. The students were looking down at their desks to see the details of the demonstration being presented before them. After the demonstration, the instructor wrote the assignment on a plastic sheet in front of him and this in turn was picked up by the students on their TV desks. Each pupil then pushed a button and a protective top covered the viewing table which was then used as a desk or work area.

The teacher stepped over to the visiting group when he noticed the amazed look on their faces. He explained how much more progress each student made and said practically all discipline problems were eliminated by the use of the TV desk. With the proper attachments, microscopic slides can be projected with as much magnification as any microscope would yield. Movie and slide or filmstrip projectors are obsolete because the instructor can place the slides in the proper TV-desk attachment and have the students see them individually without the room being darkened.

The principal stated, "Our science program now begins in the first grade instead of the ninth grade as it did some 30 years ago. Our course is set up so that a full day of general science is taught for a period of four weeks. If the student should take a lively interest in science, he can advance according to the effort put forth."

One of the visitors showed a desire to look in on the chemistry class. General chemistry is a five-weeks course for a full day. When we entered, there was no one in sight. As we walked through the laboratory, we saw about 20 students having a refreshment break and listening to music. Another small group were in the library, studying. Here again students work at their own pace.

It may be added that this particular high school satisfies secondary educational needs for an area within a 50-mile radius. There are two means of transportation to school depending on the distance and routes. Students within the 50- to 30-mile radius are picked up by a fast large helicopter at designated stops. For short runs up to 20 miles, a modern bus with reclining seats facing the rear of the bus is used. In the rear portion of the bus is a lounging area with recording device, tape player, kinescope projector, and library books.

The visitors agreed to go on a field trip that the general science class had planned. On this trip the class was to study various rock formations, effects of stream erosion, and results of the last glacier in this particular area. The group assembled at the playground-airfield in the rear of the science building and boarded the school's helicopter. In a few seconds they were airborne and within several minutes they were in the first area to be studied. It was easy to see the effects of stream erosion, the watershed areas, and how the stream was cutting a new channel in places. A little later the plane was set down in an old field for closer examination of rocks and strata formations.

An outstanding feature of the curriculum is a research-project room that has found great favor with students and teachers. Any student with a sense of responsibility who has submitted a research problem or project is permitted to use the facilities. The student must present the problem and method of solving it. If building some equipment or apparatus, a drawing of the project must be approved. About 20 of the most promising and qualifying pupils in the opinion of the science department committee, have the privilege of working in the R-P room, as it is called.

To experiment in the R-P room is to achieve the highest science recognition from fellow students and teachers. The department is equipped with a small shop for constructing most anything in wood, metal, or plastic. There are ample science equipment and sufficient work areas for each student in many branches of the sciences.

A pupil can leave at will for any other part of the building. The student keeps a log to account for his activities while in school. It trains the young scientist to write important observations and keep a daily report. The instructor can always examine the log to check on individual progress and counsel the student.

As the guests were about to leave the principal stated, "And with all the new developments and facilities to aid in teaching efficiency, a patient and well educated teacher is still of paramount importance."

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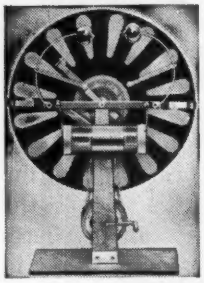

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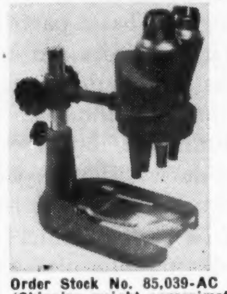

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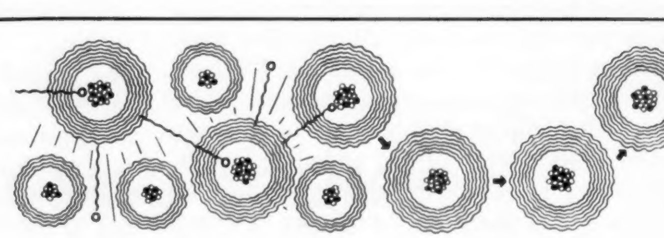

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## GENUA—continued from page 74

followed by a course in teaching science in the elementary school. This course should be taught by one who is primarily an educator with wide experience as a teacher of children and who possesses a broad background of scientific subject matter.

The effectiveness of the background furnished by these survey courses is predicated on a number of things, such as:

1. Elementary teachers should be given the opportunity to learn inductively in the subject matter courses and to participate in laboratory experiences in which the main objective is to solve problems.
2. The critic teachers at the elementary school level should know and sympathize with the main objectives of science teaching at the elementary school level and integrate areas and principles of science with other subject matter fields.

Teachers of science in the elementary school have many problems. Hence, they need to build background in science, to learn how to teach it, to find the necessary apparatus and other materials. For this work these teachers have two essential pieces of equipment: (a) they realize the importance of including science, and (b) they know the best we know about how children learn.

### Elements of Background

The following elements of background for teachers are important.

1. They should approach the teaching of science with confidence; teaching science is not much different from teaching social studies. It is easier in that science deals with concrete things and has the added advantage of touching the real interests of children.
2. The function of the elementary school teacher in science is not to be a walking encyclopedia of answers for questioning children. The purpose of the school is not to develop children who have fast answers to questions. It is, above all, to develop children who will mature in self-confidence and self-direction and will find their own answers and make their own decisions, independent of teacher and textbook. The main function of the elementary school teacher in science is to help children learn how to get valid answers, not to provide them. And in doing so, the good teacher learns with the children.
3. Teachers should start their science teach'ng by taking up a unit with which they are truly conversant. Using some element of their science training, a personal hobby, or a personal interest provides a particular background and a source of successful approach. The children will accept and follow.
4. After teachers have decided upon a unit or area of science study, they should proceed to the basic science textbooks which are on the learning level of the pupils being taught. This they should follow up by examining some good general science or biology texts, such as are used in the higher grades, to ascertain the science subject matter background essential in presenting the unit to the class.
5. To get the feel of the material in question, teachers should perform some of the suggested experiments.
6. Of course, the background of the teachers is amplified by consultation with junior high school and high school science teachers. This procedure is exceedingly helpful.
7. Finally, teachers should familiarize themselves with the material found in the teachers' manuals furnished with the textbooks.

Considering the question of the background of the teacher of elementary science in the elementary school, there is no gainsaying that knowledge of the subject is quite valuable. Some teachers without previous training in science are reluctant to teach it because of lack of equipment and experience. Actually, however, that should not be. Almost all of the principles of science important in elementary education can be demonstrated with ease and with inexpensive materials selected by the teacher.

As a matter of fact, the most important element in the background of a teacher of science in the elementary school is embodied in the following approach: The teacher believes in the importance of including science in her work; she feels that her program is not complete without it. She may not know science, but she knows how children learn. She doesn't mind being asked questions that she cannot answer because she knows how to help children find the answers.

# Book Reviews

UNESCO SOURCE BOOK FOR SCIENCE TEACHING. 220p. $2.50. United Nations Educational, Scientific and Cultural Organization, Paris. 1956.

This book is a compendium of science classroom experiences which may be carried out with simple homemade equipment. The materials were assembled from existing publications in several countries. It contains both directions for making the equipment and for carrying out the activities. Many useful suggestions for teaching both elementary and general science are included together with helpful tables, formulas, and laboratory hints.

The book contains chapters on teaching general science, making simple equipment, plant study, animal study, rocks, soils and minerals, astronomy, air pressure, weather, water, machines, forces, sound, heat, magnetism, electricity, light, the human body, notes for teachers, an appendix of tables, formulas, and laboratory techniques, together with a bibliography of science books and periodicals.

While the book was prepared primarily for use in the underdeveloped countries of the world, it should also be found useful in American elementary and junior high schools where equipment is limited. The book also offers rich suggestions for projects and for science club activities. It is available in both French and English and will later be published in Spanish. It may be obtained in the United States, either from the United Nations Book Store, United Nations Building, New York City, or UNESCO Publications Center, 152 West 42 Street, New York 36, New York.

ELLSWORTH S. OBOURN
*U. S. Office of Education*
*Washington, D. C.*

PROFESSIONAL AMATEUR: The Biography of Charles Franklin Kettering. T. A. Boyd. 242p. $4.50. E. P. Dutton and Co., Inc., New York. 1957.

There are remarkable men in the world today and this biography of "Boss Ket" tells the story of one of them. This is the life narrative of an inventor, now more than 80 years old, who, at the age of 19, was a teacher in an Ohio rural community. According to the author, a friend and associate of Kettering's for 40 years, the young teacher believed "schoolbooks ought to be 'readin'' books too;" but he also antagonized the parents of the community by teaching their children in evening sessions about "such subjects as electricity, gravity, sound, and heat. He explained the differential gear, the eccentric, and other things mechanical. He also demonstrated by simple experiments some of the facts he was telling the young people."

This attitude of the young teacher as well as his scientific curiosity as a child seem to belie the title of the book. As a farm boy he was intrigued by the work connected with corn growing, and, the book tells, on his 70th birthday, he boasted he had been "the best darn corncutter in Ohio." As a child, too, he wondered—and still wonders—about the transparency of glass and the mechanisms of photosynthesis. There are people who have called him "Mr. General Motors" because of his 27 productive years as head of General Motors' Central Research Laboratory. Through foundations he helped establish, and his support of scientific and educational institutions, he has contributed personally—and still does—to trail-blazing research on the small airplane, solar energy, and cancer. Therefore, can one call such a man an "amateur," professional or otherwise?

It is Kettering himself, however, who is responsible for the book's title. He has said, "We are simply professional amateurs. We are amateurs because we are doing things for the first time. We are professional because we know we are going to have a lot of trouble. The price of progress is trouble, and I don't think the price is too high."

This is a personalized story both in its report of Kettering's inventive genius and his relationships with his associates, and in its portrayal of his long and happy marriage which ended sadly with his wife's death from cancer in 1946. The book, therefore, has two special interest-making attributes: it is a fine biography of a fascinating personality and it is also a lucid report of scientific progress.

There are many keys in the book to Kettering's character and accomplishments. One especially worth quoting here is from remarks made by one of his associates, Dr. C. P. Rhoads. The latter said of Kettering that one of the inventor's principal beliefs " 'is that if one is to have a productive career in science, one must have some well-defined objective, whether this be the development of a better engine, the splitting of the atom, or the discovery of a better means for the control of cancer. Without objectives, he feels, scientific life is unsatisfactory and scientific work in general unproductive.' "

ROBERT H. CARLETON
*National Science Teachers Association*
*Washington, D. C.*

## Books Received

EXTRACLASS ACTIVITIES IN AVIATION, PHOTOGRAPHY, RADIO FOR SECONDARY SCHOOL PUPILS. Willis C. Brown. 48p. 25¢. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

A publication of the U. S. Department of Health, Education, and Welfare giving suggestions for club activities to school administrators and sponsors.

HINTS TO TEACHING ELECTRICITY AND ELECTRONICS. S. H. Dumville. 51p. $1. Dumville Manufacturing Co., Washington, D. C.

A guide to classroom and laboratory instruction with the use of the Dumville Electronics Educator.

# Audio-Visual REVIEWS

**THE RIDDLE OF PHOTOSYNTHESIS.** 12 min. sound, 1956. $55 B & W. Handel Film Corp., 6926 Melrose Ave., Hollywood 38, Calif.

**Recommendation:** Senior high school and adult levels; particularly useful with advanced students in biology and chemistry.

**Content:** This is the 24th film in the "Magic of the Atom" series dealing with the peacetime uses of the atom. It shows in general treatment the experimental approach to the scientific study of the process of photosynthesis, using radioactive Carbon 14 as a tracer. The step-by-step process in one of the experiments is shown in the Atomic Energy Commission's Radiation Laboratory at Berkeley, California. The film emphasizes the fact that man must learn the secrets of photosynthesis to counteract the eventual loss of soil productivity.

**Evaluation:** Good to excellent in instructional qualities, technical qualities, and classroom values. The film depicts scientific research in a clear and logical order.

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**EYES: THEIR STRUCTURE AND CARE.** 10 min. sound, 1956. B & W. Coronet Instructional Films, Coronet Bldg., Chicago 1, Ill.

**Recommendation:** Junior and senior high school levels in general science, biology, and health education areas.

**Content:** To show that the wearing of glasses is a normal thing, the film presents the case history of a boy having trouble with his eyes. It describes how eye examinations are made, other difficulties diagnosed, and glasses prescribed. The structure of the eye is reviewed in a general way and the relation of the lens action to fatigue and eye strain is explained. Different types of eye irregularities are described and the correctional values of glasses are stressed.

**Evaluation:** Fair to good instructional qualities, average technical qualities, and uncertain classroom values. The film seems to overemphasize popular appeal.

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**FOOD GETTING AMONG ANIMALS.** 12 min. sound, 1956. $45 B & W, $90 Color. Moody Institute of Science, 11428 Santa Monica Blvd., Los Angeles 25, Calif.

**Recommendation:** Biology and nature study classes.

**Content:** The food getting habits of the anteater, rattlesnake, barnacle, archer fish, and chameleon are effectively presented. Interesting sidelights on the life activities of these animals provide an informative and interesting view of their feeding techniques.

**Evaluation:** Clear narration, effective use of close-up color photography, and exceptional musical background. Details are interestingly presented.

**Many of the films** which have been reviewed in this column of *The Science Teacher* will be shown at specially arranged sessions at the NSTA Convention: Hotel Cleveland, Cleveland, Ohio, March 20-23. These Film Showings have been scheduled for Wednesday morning, March 20; Thursday afternoon, and Friday afternoon. Check your convention program for the titles of the films, time, and place.

**AQUARIUM WONDERLAND.** 10 min., 1955. $100 Color. Pat Dowling Pictures, 1056 South Robertson Blvd., Los Angeles 35, Calif.

**Recommendation:** Fourth through ninth grades.

**Content:** Depicting life in an aquarium, the film portrays how fish breathe, hear, feel, smell, and swim. It also points out what snails do for an aquarium and how plants help an aquarium in providing a balance of plant and animal life. There are effective studies of the hatching of goldfish eggs and also how to care for an aquarium. Close-up photography, microscopic photography, and animation are used to show in detail how to set up an aquarium.

**Evaluation:** Effective both in content and photography. Printed captions contribute a great deal to the usefulness of the film.

# Activities of NSTA AFFILIATES

► The CONNECTICUT SCIENCE TEACHERS ASSOCIATION has scheduled its second conference on the teaching of science on April 6 at East Hartford High School. The theme is *The Connecticut Science Teacher Looks Ahead* and the meeting will consider four subtopics: Better Instruction in Experimental Science, More Effective Use of Co-Curricular Activities, Continuing Professional Growth, and A Better Science Program. Principal speaker for the conference will be Dr. Ellsworth Obourn, Specialist in Secondary Science, U. S. Office of Education, Washington, D. C. The general study chairman for the meeting is Edward Holden, Greenwich High School.

► The Southern Section of the CALIFORNIA SCIENCE TEACHERS ASSOCIATION has chosen James T. Robinson, of Whittier, as its president.

► The ILLINOIS ASSOCIATION OF CHEMISTRY TEACHERS will hold its spring meeting on April 26 on the campus of Illinois State Normal University and University High School, Normal. The program is being planned by Dr. Carl Weatherbee, Chairman of the Chemistry Department, Millikin University, Decatur, who is president of the Association, and Dr. R. U. Gooding, Head of the Chemistry Department, Illinois State Normal University. An address by Dr. Weatherbee, discussion groups, a business session, and a demonstration of micro-techniques are planned as program features.

► Officers of the PENNSYLVANIA SCIENCE TEACHERS ASSOCIATION for 1957 are: *president,* C. Richard Snyder, Lansdale, biology teacher at Radnor High School, Wayne; *vice president,* Charles W. Rutschky, Jr., York; *secretary,* E. Jane Northey, Pittsburgh; and *treasurer,* Mrs. Helen D. Ross, Philadelphia. PSTA's 5th Annual Summer Conference is scheduled to take place at State Teachers College, West Chester, on July 19 and 20. Mr. Rutschky is program chairman.

► The OHIO SCIENCE EDUCATION ASSOCIATION, in cooperation with The Ohio State University's Department of Science Education, will sponsor a workshop for elementary and secondary school science teachers on March 15 and 16 at The Ohio State University. The program will feature speakers, demonstrations, discussion groups, and tours through university and industrial research centers. OSEA will also play an important role during the NSTA 5th National Convention March 20-23 in Cleveland. On Saturday, March 23, the Association will co-sponsor, along with the Cleveland Regional Council of Science Teachers, one of the convention's major programs—the Saturday noon luncheon.

New two-year term officers of OSEA are: *vice-president,* Joseph Maddox, Euclid; *treasurer,* Edwin Roe, Zanesville; and *secretary,* Robert F. Browning, Dublin. Charles E. Hoel, of Columbus, continues to serve as *president;* his term has one more year to run.

► The WEST VIRGINIA SCIENCE TEACHERS ASSOCIATION, in its publication titled "Atoms—Bees—Crystals," is calling upon its members to take a more active part in science activities. It suggests the forming of science clubs and, subsequently, entries in the state Junior Academy of Science Fair at Keyser, April 25-27. WVSTA has scheduled its spring meeting in Keyser on April 25, which, as the bulletin says, will permit those attending the meeting to also go to the Science Fair. *TST* is proud of a comment in the bulletin which, in suggesting membership in both WVSTA and NSTA, says: "We hope that our members are receiving benefits from the increasing improvements in *The Science Teacher* published by NSTA . . . and other notices sent by the NSTA office (which) prove helpful in finding teacher materials."

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